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On the determination of Latitude by the observed difference of Zenith Distances of the Fixed Stars when on the Meridian; By E. H. Courtenay, *late Professor of Mathematics in the University of Pennsylvania.*

Of the various methods which have been proposed for the determination of terrestrial latitude, none are entirely free from objections, and nearly all those which contemplate a close approximation to the truth, require either the use of very large and costly instruments, that are transported with difficulty from place to place, or demand an expenditure of time in conducting the observations, often disproportionate to the value of the result sought.

Every method therefore which promises to increase the accuracy of such results, and to abridge the time requisite for making the observations, deserves consideration.

Under this impression, it is my purpose to explain briefly, in the present paper, some of the advantages which are believed to belong more exclusively to the method of observing the difference of meridional zenith distances of such pairs of stars as culminate at short intervals, and at nearly equal altitudes, but on different sides of the zenith. So far as I can discover, this method has not been employed in Europe: and in this country, it was first adopted in 1834, by Capt. A. Talcott of the U. S. Corps of Engineers, in settling the positions of certain points connected with the question of the disputed boundary between the State of Ohio and the then Territory of Michigan. To that gentleman I was indebted not only for the suggestion of the method—but likewise for the opportunity to test its accuracy, by the use of the instrument employed by him in the service referred to. This was kindly deposited with me during the winter of 1835–36, and when repeatedly applied to the method in question was found to afford results fully justifying the favourable opinion he had formed of it from his own observations.

Principle of the method.—If we select two stars whose places have been well determined, and so situated that one shall culminate to the North, and

the other to the South of the observer, at nearly the same distances from the zenith, and within a short interval of time—and then conceive that we are provided with any means of measuring with precision *the difference* of their zenith distances, the latitude of the place of observation may be immediately deduced therefrom. For, since the declinations of the stars are supposed known—being given by the standard catalogue—the *sum* of their zenith distances, which will be equal to the *algebraic* difference of those declinations, will likewise be known; and the *difference* of their zenith distances having been determined by direct measurement, we readily obtain the absolute zenith distance of each star by simply adding or subtracting the half difference, to, or from the half sum. The latitude is computed in the ordinary way, as though the absolute zenith distances had been observed directly.

Description of the Instrument.—The instrument employed in measuring the difference of zenith distances, was that denominated by English artists a "Zenith Telescope"—consisting of a simple achromatic, mounted on a tripod stand, which admits both vertical and horizontal motions. To the tube of the telescope, a small graduated quadrant is permanently attached, the vernier of which reads to 1′ of a degree; and the movable arm of this vernier carries a very delicate spirit level serving in connection with the quadrant to place the telescope *nearly* at any required inclination to the horizon. The quadrant being used merely to facilitate the *finding* of the objects to be observed, a very rough graduation will suffice, but the extreme delicacy of the spirit level is all important, since, when once the instrument has been clamped in a particular position, the level is relied on to show whether the inclination of the axis of the telescope undergoes any change, and if so, of what amount. The tripod stand is furnished with feet-screws, with the usual provision for quick and slow motions, by the aid of which the axis of the column supporting the telescope, is rendered truly vertical. A horizontal graduated circle, reading to minutes by means of a vernier attached to the vertical column, serves to mark the position of the telescope when it has been brought into the plane of the meridian, and likewise enables the observer to turn it promptly through 180° in azimuth. Thus, when the telescope has been once adjusted to the meridian, and directed either to the North or South, it is readily brought a second time into that, or the opposite position, as occasion may require.

To the eye-tube of the telescope, a parallel-wire Micrometer is adapted, having one fixed vertical, or two movable horizontal wires of extreme fineness. Several eye-pieces, of different powers, usually accompany such a micrometer. With the one generally employed the field of view embraced an area of about 30′. The object-glass presented a clear aperture of about $3\frac{1}{4}$ inches in diameter—but as the central parts were very decidedly superior to the exterior, I generally used the telescope with a cap which exposed only an aperture varying from $1\frac{1}{2}$ to 2 inches, according to the brilliancy of the object observed. The focal length of the telescope was about 42 inches.

Method of observation.—Let it be supposed that a suitable pair of stars has been selected, the difference of their zenith distances being less than 30′, the diameter of the field of view; and for the sake of explanation, let the northern star be supposed to culminate first, and at the greatest distance from the zenith. Having levelled the instrument, let the vernier of the quadrant be set to the degree and minute, corresponding to an arithmetical mean between the zenith distance of the two stars, and then let the bubble of the spirit level be brought to the middle of its scale, when the axis of the telescope will have the proper elevation for finding the two ob-

jects. The telescope is now turned in azimuth about the vertical axis of the column supporting it, until the optical axis coincides with the plane of the meridian (this position having been previously determined, and marked by means of the horizontal circle,) with the object glass directed towards the north. In this position we await the arrival of the northern star in the field of view, and as this is supposed to have the greatest zenith distance, it will, by the inversion of the telescope, appear above the centre of the field. The upper horizontal wire is now moved by its appropriate screw until it is brought to cover the image of the star, when, if the micrometer has been properly adjusted, the star will continue to traverse this wire until it leaves the field. But as the observation should be made at the instant the star culminates, we wait until it crosses at the vertical wire, keeping it constantly bisected by the horizontal wire. The position of the level should be examined immediately, taking care to note the divisions on its scale corresponding to each extremity of the bubble. If time permits, the position of the upper-wire of the micrometer, as indicated by the graduated head of its screw, may next be noted, and one-half the observation will have been completed. The telescope being then turned 180° in azimuth, retaining the same inclination to the horizon, the arrival of the Southern star is awaited, and the observation upon it conducted in a similar manner—with the exception that the *lower* horizontal wire is now used.

A very little practice will enable the observer to complete the observation on the first star, and prepare for that on the second in a period of four minutes—and after he has become expert in the adjustment of the instrument, a shorter time will suffice. Thus, if the interval between the transit exceeds four minutes, the stars, if at proper altitudes, will admit of being arranged in suitable pairs: and beyond this limit, the shorter the interval the better, as less time will be consumed in the observation, and we can feel more confident that the state of the atmosphere, and the condition of the instrument, have undergone no material change. When the interval is very short, the reading of the micrometer wire first used, may be deferred until after the completion of the observation on the second star.

The observations having been completed, a comparison of the readings of the two micrometer screws will give the difference of zenith distance of the two stars, which must be corrected, in all cases, by the readings of the level, if the extremities of the bubble have not marked the same divisions in both cases.

The advantages offered by this method may be enumerated as follows:

1. That it obviates almost entirely the errors likely to be introduced by an undue allowance for the effect of atmospheric refraction—for since it is only the half *difference* of the refractions which is applied as a correction to one-half the observed difference of Zenith Distances, and as the entire value of such correction will rarely exceed half a second, where the stars are advantageously situated, and do not differ more than 30′ in altitude, the *error* committed in estimating this correction must be extremely minute. It will be obvious also that simultaneous observations of the barometer and thermometer, always necessary when absolute altitudes or zenith distances are observed, may be wholly dispensed with, the effect due to the variations being quite inappreciable.

2. The only angular measurements required are made by means of a micrometer, the value of whose divisions may be rigidly tested by the observer as often as he may think proper, and with the greatest facility. The divisions of the micrometer may be read with perfect certainty to within

one half a second—a limit smaller than that which the optical power of the telescope will permit to be appreciated. Thus the errors usually arising from incorrect graduation and imperfect reading when verniers are employed, are in a great measure avoided.

3. The large dimensions of the telescope afford a high optical power, whilst the great simplicity of the other parts of the instrument permit its weight to be very moderate, thus rendering it extremely portable.

4. The observations are of so simple a character, that one person without the aid of an assistant, may readily conduct them, without incurring the risk of considerable mistakes, so likely to occur when the observer is hurried. And by selecting various pairs of stars, and repeating the observations on the same pairs, on successive nights, the observations may very soon be so far accumulated as to increase greatly the chances of accuracy.

5. By the use of various stars, the errors resulting from the erroneous determinations of their places (as given in the standard catalogues,) will probably tend to destroy each other, these errors lying sometimes in one direction—at others, in the contrary.

6. The instrument can be furnished at a moderate cost—is but little liable to injury or accident, and with reasonable care will very seldom require repair.

The only serious objections which are likely to be offered to this method of determining latitude, are—1st, the necessity of making our selections of stars from those whose places have not been settled with the greatest accuracy: and 2d, the necessity of computing the true places of the stars on the days of observation.

To the first of these objections it may be answered, that the places of a very large number of stars have now been determined with such precision, as to afford numerous pairs suitable for all northern latitudes, and almost certainly to be relied on to within 3 or 4 seconds at the utmost—in most cases, to a much smaller limit. The second objection will also be found to have less weight than would be generally attached to it, when the computor has accustomed himself to the use of the admirable table of constants given in the Catalogue of the Astronomical Society of London, in connection with the constants now furnished by the Nautical Almanac.

When a pair of stars has been selected, their places may be computed for every tenth day during two or three months, with very little more labour than would be requisite to determine them on two or three different days during that period, and as their places may vary very slowly, a simple proportion will suffice to determine them at any intermediate epoch.

It will also occasionally happen that one or more pairs of suitable stars can be selected from the catalogue of 100 stars, whose true places are now given for every tenth day in the Nautical Almanac, and the necessity of computing the effects of aberration, precession and nutation will then be entirely superseded.

There are cases also when the objection first alluded to, that of placing too great a reliance on the places of those stars whose declinations have not been determined with great precision, becomes entirely unimportant. When, for example, it is proposed to find only the *difference* of latitude between two places situated nearly on the same parallel, it will frequently occur that the same pairs of stars may be observed at both places. In such cases, the same error being introduced into each latitude by an erroneous estimate of the declinations of the stars, it will disappear when the *difference* of those latitudes only is considered; and, if in addition, the latitude

of one of the places has been very carefully determined by other means, this method of observation will furnish a simple and very accurate mode of settling the latitudes of other adjacent places.

For the purpose of presenting a simple and clear view of the degree of accuracy which may be expected with this method of observation, a table is annexed, exhibiting the results of a series of observations undertaken by myself in the winter of 1835–6, for the express purpose of testing its efficiency. The mean places of the stars, used in deducing the latitude were taken exclusively from Pond's Catalogue of 1112 stars; and their true places were computed by means of the constants in the catalogue of the Astronomical Society, whenever the same stars were likewise found in the latter catalogue. In other cases, the constants were computed directly by the usual formulæ.

It may be proper to remark that the results here given have not been selected with any reference to their more exact agreement with each other; but on the contrary, they present a perfectly fair view of what may be anticipated from this method of observation, as soon as the observer has acquired a moderate share of skill in the use of the Instrument. Indeed the only observations which have been excluded, were those in which it was found, upon trial, to be impossible to make the observations satisfactorily, in consequence of the stars being very near the extremities of the field of view. This would, of course, happen only when the difference of their zenith distances, was nearly 30′.

In making these observations, the instrument was placed on a stand in the yard of my house in Philadelphia at the S. E. corner of Spruce and Broad streets, the centre of the stand being 90 feet from the front on Spruce, and $5\frac{1}{2}$ from that on Broad street: and as nearly as I can estimate from the plan of the City about 7.″ 93 South of the steeple of Independence Hall. The latitude of that building as given in the American Almanac, is

	39.° 56′ 59.″ 00
From which subtracting 7.″ 93	7.″ 93
Leaves the latitude of the spot occupied by the instrument,	39.° 56′ 51.″ 07
And the general mean of my observations shewn in the annexed abstracts,	39° 56′ 50.″ 60
Difference,	0.″ 47

I am unable to state in what manner the result given in the Almanac was obtained, and cannot judge therefore of the degree of reliance to be placed on it. Most probably it has been determined with considerable care—and if so, the close agreement of the two results is a strong evidence in favor of their accuracy.

Abstract of Results furnished by a Series of Observations for Latitude of the difference of Zenith Distances of N. and S. Stars; the Instrument employed being a Zenith Telescope, furnished with a Level and Micrometer.

Date.	Pairs of Stars.	Latitude.	Date.	Pairs of Stars.	Latitude.
1835.			1836.		
Nov. 20	υ Pegasi & 2807 Cassiopia	39° 56′ 48″.83	Jan. 23	π Tauri & 552 Camelop.	39° 56′ 50″.18
25	" "	47″.37	Feb. 10	" "	48″.11
Dec 1	" "	50″.56	10	834 Camelop.& 840 Monoc.	52″.67
3	" "	49″.32	M'ch 23	" "	50″.49
8	" "	48″.18	April 6	ο Ursæ Maj. & θ Cancri	53″.00
22	" "	50″.55	6	1148 Ursæ Maj. & π Leonis	50″.13
23	" "	49″.80	Feb. 10	765 Camelop. & γ Geminor.	48″.67
Nov. 20	υ Pegasi & π Cassiopia	47″.84	10	764 Camelop. & χ Orionis	46″.59
25	" "	48″.11	10	764 Camelop. & γ Geminor	48″.50
Dec 1	" "	49″.52	10	764 Camelop. & χ^3 Orionis	48″.83
8	" "	47″.26	10	715 Camelop. & χ^3 Orionis	49″.00
22	" "	50″.57	10	715 Camelop. & χ^1 Orionis	46″.75
23	" "	49″.26	Jan. 23	552 Camelop. & ο′ Orionis	53″.67
Nov. 21	ο Piscium & 209 Cassiopia	51″.26	May 12	ο² Camelop.& θ Virginis	51″.27
25	" "	50″.76	13	" "	54″.30
26	" "	51″.12	12	ο′ Camelop.& θ Virginis	49″.36
28	" "	49″.78	13	" "	52″.63
Dec. 23	" "	51″.04	8	λ Draconis & ο Virginis	51″.44
Nov. 25	δ Cephei & λ Pegasi	49″.52	10	" "	51″.89
Dec. 1	" "	51″.94	12	" "	51″.20
3	" "	50″.39	8	θ Virginis & k Draconis	49″.90
23	" "	51″.11	9	" "	51″.85
23	ξ² Arietis & ν Custa Mess	51″.44	10	" "	51″.66
Nov. 25	ζ Cephei & λ Pegasi,	46″.36	12	" "	50″.45
Dec. 3	" "	48″.46	13	" "	51″.62
Nov. 21	209 Cassiopia & ξ′ Ceti	52″.13	May 6	ξ′ Virginis & k Draconis	47″.84
25	" "	52″.19	8	" "	50″.59
26	" "	51″.18	12	" "	58″.90
28	" "	51″.99	Ap'l 24	λ Draconis & ξ′ Virginis	51″.32
Dec. 23	" "	50″.87	May 5	" "	52″.28
1836.			8	" "	51″.90
Jan. 23	" "	51″.31	12	" "	51″.76
1835.			Ap'l 24	ρ Leonis & 126 Ursæ Maj.	51″.05
Dec. 23	287 Arietis & γ Persei	51″.78	May 8	" "	50″.41
1836.			9	" "	50″.58
Jan. 23	" "	51″.68	10	" "	50′.53
1835.			12	" "	51″.44
Dec. 23	304 Arietis & γ Persei	53″.58			
1836.					
Jan. 23	" "	53″.87			
1835.					
Dec. 23	ξ Arietis & 371 Camelop.	54″.99			
1836.					
Jan. 23	" "	53″.39			

TABLE CONTINUED.

General mean,	39° 56′ 50″.60	Mean of the 26 observations in April and May,	39° 56′ 51″.20
Greatest variation from mean,	4 39	Greatest variation from mean,	3. 36
3 variations exceeding	4	2 variations exceeding	3
6 betwen	3 & 4	0 between	2 & 3
10 between	2 & 3	6 "	1 & 2
23 between	1 & 2	18 below	1
32 below	1	Mean variation of the 26 observations.	0. 89
Mean variation of the entire series of 74 observations.	1. 39		

If the places of the several stars observed were given with absolute accuracy, it would be proper to take a general mean of all the *independent* results, thus assigning an equal weight to each observation—and for the sake of simplicity this has been done—although, strictly speaking, the places of certain stars having been determined by a large, others by a very small number of observations, the positions of the former are to be relied on with greater confidence than those of the latter. It may also be observed that the results given in the preceding table, are not *all* perfectly independent. For in some instances it was found possible to combine more than two stars; when, for example, one northern star having nearly the same zenith distance as two southern stars, could be observed without a change in the inclination of the telescope, two different results would be given by *three* observations, whereas *four* would usually be required. It has been deemed sufficient, however, for the present purpose to compare the separate results with an indiscriminate mean, a slight variation in which would have but little influence on such comparison. By subtracting each result separately from the general mean, it will appear that the extreme variation from the mean is but 4″.39, and that the average variation from the same quantity in the entire series of 74 observations is 1″.39. An examination of the table will also exhibit very satisfactorily the rapid diminution in the number of errors as the limits of error are increased, there being but 3 errors exceeding 4″—8 between 3″ and 4″—10 between 2″ and 3″—23 between 1″ and and 2″ and 32 below 1″.

It was reasonable to expect that the observations latest in point of date would present results yet more nearly accordant with each other, than those afforded by the entire series, as some time was requisite to acquire the habit of using the instrument in a manner entirely satisfactory. Accordingly, a comparison was made of the 26 observations latest in point of date—the results of which are given in the table. In this series the average variation from the general mean is reduced to 0″.89; the greatest variation to 3″.36, and 24 out of the 26 errors are below 2″.

Undoubtedly very many of the larger discrepancies are to be ascribed to erroneous assumptions of the places of the stars—not to the errors of observation. This will appear very clearly by comparing the different results given by the same pair of stars on different nights. The greatest difference between any two results thus obtained, will be found to be 3″.27.; whereas the extreme difference between the greatest and least in the entire series is more than double the quantity.

Whilst insisting earnestly upon the advantages of the method of observation above described; it is not pretended that each of these advantages may not be secured separately by other methods; but it is doubted whether any other combines in so great a degree the recommendation of convenience, accuracy and despatch.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Remarks relating to the Storm of March 17th, 1838. By James P. Espy.

PART I.—CONDENSED STATEMENT OF THE FACTS.

It appears from the facts detailed in the report of the committee on Meteorology*, that a storm of rain and snow of great violence was raging on the 17th of March, reaching N.E. and S.W. from the Western extremity of N. Carolina to the N.E. extremity of Pennsylvania—and in a N.W. and S.E. direction, from about the middle of Ohio, to the Eastern extremity of N. Carolina, and East and West from beyond Lexington, Kentucky, to some distance into the Atlantic beyond the Eastern shore of Maryland. The storm was much the greatest on the 17th, and its boundaries on this day about noon, have been represented by the middle circle in the map accompanying the report of the committee. This storm moved along the surface of the earth nearly towards the East.

It appears that the Barometer fell on the 17th in all places near the centre or far within the boundaries of the storm—and rose in many places near its borders, and beyond them; especially in the extreme W. and NE. (see Lexington, and Montreal, and Providence, and Middletown.)

It appears also—what might naturally be expected from the fall of the Barometer within the storm—that the wind at the borders and for some distance beyond, blew inwards, towards the storm. The information which we have at present does not enable us to know whether the Barometer stood lowest in the very middle of the storm or not. If it did—and there were no general currents in the atmosphere to produce oblique forces, the laws of dynamics justify us in expecting the wind in such case to blow *inwards* from the circumference, exactly towards the centre, just as we would expect the wind to blow outwards *from* the centre of a storm—if there was any cause in nature to make the Barometer stand constantly higher at that point than in the circumference.

By casting the eye on the map accompanying the report, it will be seen that there is no one point at which all the arrows, if prolonged, would meet. There is indeed much irregularity in this respect. For example the arrow near Jamestown, N. Carolina, which is south of the centre of the storm, still shows the wind N.E.; as if the point of greatest depression of the Barometer, was near the southern border of the storm; somewhere in N. Carolina: while in the Northern part of the storm, the arrow for Silver Lake, shews the wind to be N.W.; as if the point of greatest depression of the Barometer was near the North part of the storm.

And yet, if the strong winds be considered in the extreme boundaries of the storm, for example, Springfield and Wilmington, in Ohio, and in the east (all the observations from the Chesapeake to New York,) these arrows being prolonged will meet very little south of the centre of the storm; and, as the winds were all strong and steady, for many hours, and were under the *general* influence of the whole storm, and not affected by any *particular* localities, they speak a language which cannot be mistaken.

The wind could not blow thus strongly inwards for many hours without moving upward in the centre of convergeance: whether that was the centre of the storm or not, and as the barometer continued to fall in the region of the storm during the whole day, the air must have flowed outwards from the region of the storm *above* even faster at first than it flowed in-

*See this Journal for last month.

wards *below*, otherwise the barometer would not have fallen within the storm.

The storm was so nearly round on the 16th and 17th, that it would be an affectation of accuracy beyond our data, to give any other figure in the topographical chart. It was also so nearly the same size on each of those days that it is impossible to say on which day it covered the largest territory, the quantity of rain and snow known on the 16th, was small, while that on the 17th was very great. But on the 18th, it greatly increased its size, (*if it remained round,*) for on that day its diameter from S.W. to N.E. along our coast was more than 600 miles, reaching from N. Carolina, to Maine. Whereas on the two preceding days it was only about 500 in diameter.

From the 16th to the 17th, the storm travelled towards the East or even a little South of East: for on the 16th there was considerable snow in the Southern part of Michigan, and on the night of the 16th, and on the 17th, there was very little snow at Meadville, Pennsylvania; though Meadville is on a lower latitude. But on the 18th the storm manifestly moved towards a point North of East, for, at half past one P. M., it began to snow in Portland, Maine, 2 degrees further North, than it extended while in Pennsylvania.

Whether this extension of the storm further North, depended on the direction in which its centre was moving, or on a general widening out of the storm, cannot be determined; as its southern boundaries on that day are not strictly defined by the facts collected. It certainly extended down to Lat. 38° in Long. 73°, wind still N.E. And there were strong gales W.S.W., about that time, from Lat 31° to Lat. 34°. Though the packet ship Algonquin, in Lat 37° 50′ (Long. and time of day not given) says nothing of the storm of that day—but speaks of the one on the day before, it would be extremely desirable to know what her log-book says of the storm after she took the gale E.b.N. near the Delaware Capes, at 8 A. M. of the 17th, and then hauled off. As she went to the South—her log would probably be able to answer a very interesting question which our present information leaves undetermined. *In what direction and with what force did the wind blow on the South East side of the storm on the 17th.**

This storm travelled with a velocity of about $18\frac{1}{8}$ miles an hour from beginning to beginning. It was just one day in reaching Philadelphia, after it commenced in Springfield, Ohio; a distance of about 435 miles, and a comparison with other points agrees well with this.

There is one *apparent* anomaly worthy of particular notice. On the N.N.E. of the storm 80 or 100 miles beyond its extreme boundary, there is a region, from which the wind seems to have blown outwards in all directions.

Albany seems to be included in this region—and if it shall be found, that at Albany and the town near it, or perhaps as far West as Utica, the barometer rose considerably on the morning of the 17th, one step will be made in the explanation of this phenomenon, whatever may be the cause of this rise.

But the two most remarkable irregularities of all will be found at Meadville, Pennsylvania, and Lexington, Kentucky.

*Any further information concerning this storm will be gladly received. If every person keeping a journal of the weather within and for some distance beyond its boundary would send a copy of it for the 15th, 16th, 17th, and 18th March, the apparent irregularities of this storm would probably be explained.

Here the wind seemed to blow almost in a tangent to the storm. There is an irregularity somewhat similar to this on the South East side of the storm at New Garden, N.C. where the wind was N. E. all day, probably not strong, as the force is not mentioned. In short, by casting the eye on the chart it will appear, by directing the attention to the N.W. side of the storm, that the wind had a tendency to rotate from right to left; and again, if the attention be directed to the S.E. side of the storm, it will appear that the wind had a tendency to rotate from left to right—which precludes the idea of a general rotation the same way—and shews that there was some cause which induced the wind at the extreme N.W. and S.E. and E. to move towards a point in the storm, south of its centre. These anomalies cannot be explained fully by the facts collected without the aid of hypothesis, and I do not permit myself to *hypothesise*. We have no barometrical observations South of Washington; yet from the immense quantity of rain and snow which fell in the Northwest corner of N. Carolina, it is not improbable that a much greater quantity fell in the Southern part of the storm than in the Northern.

Besides, as the barometer fell much more at Washington city than at Philadelphia, and places further North, it may be that it fell still more further South and West. But I forbear to conjecture.

Part II.—Rationale.

It will not be esteemed by the reader impertinent in me to offer my views as to the modus operandi of nature in producing the various phenomena accompanying the storm of the 17th March, as detailed in the "Report" of the Meteorological Committee, and summed up in the preceding "Remarks."

The upward motion of the air in the region of a storm, may take its commencement either from a higher temperature, or a higher dew-point.

As the air rises in the inner portions of the storm, it is reduced in temperature by diminished pressure, a little more than one degree for every hundred yards of its ascent, as I have ascertained by experiment; and when it has ascended as many hundred yards as the temperature of the air is above the dew-point, the vapour will begin to condense into cloud, and give out its caloric of elasticity—this caloric of elasticity is received by the air in contact with the condensing vapour, and prevents the air in its further ascent from cooling as fast as it would, if there was no vapour in the air to condense; and, I find, both by calculation and experiment, that in ordinary states of the dew-point, it cools only one-half degree each hundred yard of its ascent above the base or lower part of the cloud; and that in all states of the dew-point, the air in the cloud at the moment of its formation, is expanded about 5600 cubic feet for every cubic foot of water generated by the condensed vapour, after making allowance for the condensation of the vapour itself.

This great expansion of the air in the cloud will cause a rapid ascent and out-spreading above, which will cause the barometer to fall under the cloud, and if there was no current above, it would spread out on all sides equally in an *annulus*, and cause the barometer to rise all round the storm, as much on one side as another. But as there is known to be an upper current always, or almost always, moving in this latitude towards the N.E. or E.N.E., this current will cause the out-spreading of the air to be chiefly in that direction, and consequently the barometer will rise chiefly on that side of the storm, at the very time it is falling within the storm, as it actually did in Connecticut and Rhode Island, while it was falling in Annapolis and

Washington City. Now if it should be found that the rise extended to Albany and Utica, the explanation of that remarkable phenomenon mentioned before, of the winds blowing outwards in all directions from that region, it will be acknowledged that this is the true explanation of it.

If it should be found that the barometer did not rise at these places, some other facts may yet be discovered to explain the anomaly.

On the very great irregularities presented at Meadville and Lexington, I have nothing entirely satisfactory to say. In a storm of such great magnitude, many irregularities might be expected.

I have been told by those who have witnessed the phenomenon, from very lofty mountains, when it is raining in the valley below them, that the top of the cloud, which they could see spread out before them, did not exhibit a level plain, but many pyramidal elevations were to be seen rising considerably above the ordinary level. Now this seemed to indicate a more violent action under those elevations than in the other parts—and if we conceive the action very great, as it is in all summer hail storms, in which the drops of water are carried up to a great height and frozen—the snow might not be permitted to fall down where it was generated, but be carried off to some distance from where it was taken up, and thrown down in such quantity as to cause, by its weight and cooling effect together, the wind to blow outwards in all directions from its place of descent. Many such places might be formed in a storm, 500 miles in diameter, and, of course, many irregularities be produced, similar to the one in question. These particular, violent, upmoving currents, and down-falls of snow by their side, would be very likely to occur in the neighbourhoods of hills and mountains. For, the air rushing in towards the centre of the general storm, on coming to a hill, will glance up it, and, having acquired an upward motion, will be inclined to continue it, and thus produce the effect in question. For if the hill is very lofty, as the Himalehs, the snow will be thrown down on the windward side; but if it is of moderate elevation, the snow may be thrown down on the leeward side. In the former case the wind may be forced down the side of the mountain on the windward side at the surface of the ground, whilst a few hundred yards high, it may be blowing up the mountain over that at the surface of the earth blowing downwards. This is probably the case in what is called the *helm-wind* in England.

It is also known that a violent summer's shower often causes the wind to blow outwards in all directions from the falling shower, when a few minutes before it had been blowing the contrary way, towards the forming cloud, and the wind at some considerable distance from the falling shower, still continues to blow towards the rain, glancing up over the out-moving current. In this way, new columnar clouds are seen to form rapidly to the windward of the rain cloud. If, during the progress of a great storm, it should sometimes snow or rain violently, and at other times stop, with increase or diminution of wind, it might be safely inferred that some such action as that just described is going on. In that case, too, a person below the clouds may sometimes distinguish these cones, which raise their tops above the general level of the cloud above, for their bases will be much blacker than the surrounding clouds. After all, we must wait for future and more abundant facts to explain these irregularities.

As to the direction in which the storm moved and its velocity, we have but little to say; because it is entirely beyond the power of the theory to predict in what direction storms in general will move. It is highly probable indeed, that very narrow storms of great violence, such as tornadoes, in

which the drops of rain are not permitted to fall back through the ascending current, but are thrown outwards, at a great height, frozen into hail, will all be found to move in the direction of the upper-current—that is, westwardly, or, towards the west in the torrid zone, northwardly from the tropic of Cancer to latitude 30, and northeasterly, or eastwardly in the latitude of Philadelphia.

For the tornado cloud, forming only when the dew-point is very high—that is when the steam-power in the air is very great (for all storms are produced by steam-power,) it will rise very high, and of course a large portion of its upper part, being in the upper current of air, it will be pressed by that current in its own direction. Therefore the tornado, as long as it lasts, must move in that direction. But in case the rain falls down through the base of the cloud, as in ordinary showers, the descent of the rain produces a disturbing force below, and the accumulation of drops of rain in the cloud prevents the cloud from rising so high into the upper current as in the tornado cloud, and besides the air, on the northern border of the storm being colder and of a lower dew-point, will, by its greater weight, have a tendency to press the storm towards the south, and these forces not being exactly known in quantity, we must wait till a patient induction from accumulated facts shall solve this most interesting problem.

Another highly interesting question can only be answered by very numerous observations with the barometer. How far is the snow and rain carried by the out-moving current above, beyond the up-moving current in the middle of the storm?

This distance will no doubt vary with the violence of the storm. In a case of great violence, if the storm is quite narrow, the upward current in the middle may be so great that the snow or rain may not be permitted to fall in the centre of the up-moving current at all—but be compelled to pass outward above in all directions, and fall down in an annulus, where the barometer may even be above the mean, and rise during the fall. Something of this kind seems to have taken place in the present storm, in the northern part of Pennsylvania, extending from Sunbury and Silver lake, even as far down into the centre of the State as Bellefonte. For, at the two former places the barometer did not fall at all, and at the latter, its fall was hardly sensible. At these places, therefore, it is highly probable, there was no upward current of air, and consequently the snow which fell there, must have been generated at a distance. How far this fall of snow may have been, not only the cause of the irregularities at Silver Lake and Meadville, which were mentioned before, and of the very gentle winds about this region, but also of the general tendency of the winds to move on the east and west side of the storm towards a point south of the centre, it is not necessary for me now to determine; at present it is sufficient to have pointed out this source of irregularity, and leave it to future investigation to determine its exact amount.

Another highly important question is suggested here—how far beyond the boundary of the falling rain or snow in these wide extended storms, does the wind blow inwards towards the storm? And how long before the beginning of the rain or snow, does the wind change in front of the storm? It seems probable that the time and distance to which the in-blowing extends, will be directly as the magnitude of the storm, and the facts ascertained are favorable to this deduction. At Philadelphia the wind changed round by N. to N.E. exactly 24 hours before the rain commenced. At Middletown, Conn., the wind changed about 24 hours before the storm came on. At New Bedford and Northborough, Mass., and at Providence, R. I., the wind

changed round from 30 to 40 hours before the commencement of the snow. But in no case did it become so violent as to attract much attention, until within a few hours of the commencement of the rain or snow. I say rain or snow, for in the northern parts of this storm, it was snow, and in the southern parts, rain and hail. And it is worthy of particular remark, that during the whole progress of this storm as far as our observations reach, the wind was most violent on the N.E. of the storm, and least violent on the S.W. of it. This is what we ought to expect from the rise of the barometer on the N.E. side of the storm, as mentioned before. I have in my possession proofs that this is the case in *some* other wide-extended storms; further investigation must decide whether it is the case in *all* such storms.

Even in those very narrow storms called *Spouts*, I have been informed by eye-witnesses that some have the trees thrown down contrary to the motion of the spout along the surface of the earth. Such has not been the fact in those spouts which I have visited. In all I found the tops of the trees on the south side of the spout lying towards the N. E., on the north side towards the S.E., and if occasionally trees were lying across, those underneath were thrown inwards and backwards, and those on top were thrown inwards and forwards. The Brunswick spout of the 19th June, 1835, affords a well known example of this, an account of which is given by A. D. Bache, President of the Griard College, in the transactions of the American Philosophical Society, and also by Professor W. R. Johnston, in the Transactions of the Philadelphia Academy of Natural Sciences.

Another remarkable fact will not escape the observation of the reader, who examines with care the report of this storm. The wind on the 16th, before very much rain and snow had fallen, was every where feeble and irregular, and especially so in the New England states; but on the 17th, when much rain and snow had already fallen, the wind became strong, and the irregularities nearly ceased. So on the western border of the storm, at Wilmington, for instance, the wind was much stronger on the 17th than it had been on the 16th.

The several links of our chain of argument may now be exhibited in juxtaposition.

1. The air did blow inwards towards a region not far from the southern border of the storm.

2. The air did therefore ascend over that region.

3. It cooled a little more than one degree of Fahrenheit for every hundred yards of its ascent, as is known by experiment.

4. When it ascended as many hundred yards as the temperature of the air was above the dew-point, the vapour in the air would begin to condense into cloud.

5. When the vapour began to condense, its caloric of elasticity would be given out to the air in contact with the condensing vapour.

6. This caloric of elasticity would change the law of cooling, in ordinary states of the dew-point, from one degree for a hundred yards of the ascent to one-half a degree, so that the air *in* the cloud was one-half a degree warmer than the air on the *outside* of the cloud, for every hundred yards above its base.

7. The specific gravity of the cloud will thus be less than that of the air at the same height, a quantity which can be calculated if the dew-point and the height of the cloud are given.

* It has since been ascertained that the wind on the 17th, was extremely violent all day at Emmitsburg, Maryland, from N. to N.W.

8. The air in the cloud will therefore move upwards in the middle, and outwards above, and inwards below, with a depression of the barometer under the cloud, and a rise all round the cloud, produced by the outspreading of the air above.

9. If the depression of the barometer is given, the velocity of the upward motion will be known, at least in the case of tornadoes or spouts.

10. If the velocity of upward motion is known, the quantity of vapour condensed in a given time is known.

11. The commencement of this upward motion may depend either on a higher temperature, or a higher dew-point than in surrounding regions.

12. The barometer would probably rise more on the N.E. side of the storm than on any other side, on account of the general motion of the upper portion of the atmosphere, being towards the N.E. in this latitude.

Franklin Institute.

Circular of the Committee on Meteorology.

SIR:—The occurrence of a storm of unusual violence, on or about the 11th of September, current, induces the committee again to address their correspondents and others who may feel an interest in the promotion of Science, to request of them such information as they may be able to furnish upon the following points;

1st. When did the storm immediately preceding the 13th September 1838, commence and terminate?

2nd. In what direction did the wind blow, and with what force during the storm?

3rd. Was there much or little rain? If the observer was beyond the boundary of the storm, how did the wind blow as to strength and direction during the 11th 12th, and 13th?

Should the committee receive such answers to their questions as may enable them to ascertain the chief phases of this storm, it is their intention to publish a report of the same, which they will have pleasure in transmitting to you.

The reports received relative to the storm of the 16th, 17th and 18th of March last, have been collated, and will be published in a few days, accompanied by a map of the United States, upon which is delineated the apparent path of the storm; copies of the report and the map, will be forwarded to the correspondents of the committee at an early day.

Any further facts relating to this storm, particularly from Maryland, Virginia or North Carolina, will be highly acceptable.

Communications to be addressed to William Hamilton, Actuary—Franklin Institute, Philadelphia.

ROBERT DUNGLESON,
ALEX. DALLAS BACHE,
JAMES P. ESPY,
CHARLES N. BANCKER,
JOHN K. KANE,
HENRY D. ROGERS,
SEARS C. WALKER,
ROBERT M. PATTERSON,
JOHN C. CRESSON,
GOUVERNER EMERSON.

Philadelphia, September 18th, 1838. Committee on Meteorology.

Mechanics' Register.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER 1837

With Remarks and Exemplifications by the Editor.

386. For an improvement in the *Machine for Sawing Shingles;* Zebulon Sargent, Contocookville, Miama county, New Hampshire, December 1.

This machine is dependent for its novelty upon the particular arrangement of its parts, for the effecting of an object which is accomplished by a large number of shingle machines, the claim being to "the mode of gauging the thickness of the shingle, and vibrating the bolt, so as to present alternately a tip and a but to the saw, in the manner described; and to the combination of the various parts as described, for running back the carriage."

387. For an improved *Cooking Stove;* Nathaniel Walker, Dighton, Bristol county, Massachusetts, December 1.

"What the inventor claims as original, and invented or discovered by himself, is the movable sliding box and grate for burning anthracite coal, constructed as described; the particular manner of dividing the fire room into an upper and lower chamber; the dividing the upper chamber into two apartments for the purpose of insulating either chamber, and directing the whole power of the fire into either, by means of the damper before described; and the manner of affixing the sliding plate between the fire room and the oven, by which the bottom of the oven is made accessible."

The foregoing is a formidable list of claims, yet the stove to which they refer, is in its general construction like many others; the things claimed to be done, have, generally speaking, been previously effected, but the mode of accomplishing them is varied; whether those who use this stove will find these variations to constitute real improvements, is a question which they may answer.

388. For an improvement in the *Steering Wheel, for Ships and other Vessels;* Andrew Thorne, Boston, Suffolk county, Massachusetts, December 1.

The wheel referred to, is the common vertical steering wheel, which may be made to act directly upon the barrel on which the steering rope is wound, or may be disengaged so as to turn independently of it, when it may be thrown into gear with a spur wheel and pinion, to increase the effect of the power applied. The claim is to "the combination with the steering wheel of a series of toothed wheels of varying diameters, arranged and brought into gear as described, or by any other of the known or common methods by which a change may be easily and instantly produced in the effective power, by a change of gearing, so that the man at the wheel can at pleasure give to it a greater or less power over the tiller, as light, or strong winds may render necessary, or desirable."

The mode of engaging and disengaging, applied to the steering wheel as

described in the above named patent, is common in machinery of various kinds. It is, for example, used in capstans, and, probably, has been employed on steering wheels also; but, of course, this was not in evidence, or the patent would not have issued; it will be seen that no pretence is made to any novelty in the manner of changing the gear.

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389. For an improvement in the *machine for Sizing Paper;* John Ames, jr. Springfield, Hampden county, Massachusetts, December 1. (See Specification.)

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390. For improvements in the mode of constructing *Saw Mills, for Sawing Timber;* John Ambler, city of Philadelphia, December 1. (See Specification.)

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391. For an improved *Machine for preparing Ice for Shipping and Storing;* Nathaniel J. Wyeth, Cambridge, Massachusetts, December 1.

This machine consists, principally, of an iron frame which may be about three feet long, and two feet wide, the parallel sides having iron plates upon them, the lower edges of which are to run in grooves previously made in the ice to guide them. There are to be steel cutters, held in place like the cutting iron of a grooving plane, which are to cut the ice, as the machine passes along. It is to be drawn by a horse, and to have a man seated on it, whose weight will cause the cutters to operate. There is, also, a cutting knife, which crosses the machine, and is to shave off the surface, when necessary to remove snow, or other matter, therefrom. The claim is to "the combination of the various parts and portions described, in such a manner as to form the machine aforesaid"

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392. For improvements in the construction of the *Saw Cylinder for Cotton Gins;* Jacob Idler, city of Philadelphia, December 1.

This patent is taken for the employment of metallic rings between each of the saws, in order to keep them apart. These rings are to be cast with arms, in the manner of ordinary cast wheels; the spaces between the wheels will, it is said, allow room for the buckle in any of the saws to be relieved without the edges being affected thereby. An iron shaft is to pass through the centres of these disks, and of the saws, which are to be wedged, or screwed up, in the ordinary way.

The claim is to "the forming the cylinder of the said cotton gin with hollow cylindrical metallic sections; with projections or bearings on the sides of the arms and ends of the sockets of said sections, for sustaining, in conjunction with the sides of the rings or sections, the circular saw plate, in a firm and true position on the shaft, and parallel with each other; the spaces formed between the arms and bearings, allowing room for the swellings or bucklings of the saws, so that the part of each saw plate outside of the cylinder, which runs between the ribs or combs of the gin, shall always be true and even."

We believe that gin saws are not now usually made of round plates of steel, like circular saws, but of two, flat semi-hoops, the inner edges of

which are confined between the disks by which the saws are divided; these are cheaper than whole plates, and are less liable to buckle.

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393. For improvements in the *Machine for Steaming and Mashing Apples;* John Dimm, Greenwood, Juniata County, Pennsylvania, December 1.

This apparatus is to prepare apples for fermentation by steaming and crushing them, so as to reduce them to a pulp, or pommage. A rectangular box is made, across which there are two fluted rollers for crushing the apples; this box is surmounted by a hopper, having a close lid, to retain the steam which is to be introduced into it. Above the crushing rollers there is a horizontal sliding shutter, fitting the box, and supporting the apples in the hopper. This shutter is made of two boards placed one above the other, and having a space between them into which the steam is to be introduced through a suitable tube.

The upper board is perforated, so as to allow the steam to pass through, and to act upon the apples in the hopper; when they are sufficiently steamed the sliding shutter is withdrawn, and the apples then rest on the fluted cylinders. Motion being given to these, by a winch, the apples are reduced to pulp, and fall upon an inclined trough below, which conducts the pulp away, prepared for the fermenting tub. The claim is to "the combination of the steaming apparatus with the mashing cylinders, for mashing apples, as above described."

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394. For an improved *Excavating Machine*; Thomas Claton, Shelbyville, Shelby county, Indiana, December 1.

Claim. "I do not claim the employment of a box, to receive and carry off the earth; but what I do claim, is the form of the bottom of the plough, being made with two plane surfaces, instead of curved, as is usual; the line forming the angles of these planes, being so situated that the weight of the earth, when the box is full, will throw the front of the plough up, as set forth."

This plough, as it is called, resembles the common scraper in having a cutting edge in front, and a box to receive the earth. On one of its sides there is a beam like that of the plough, and carrying a coulter. The share, or cutting edge of the box, runs obliquely, to cause it to cut the more easily.

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395. For an improvement on the *Plough;* Stephen McCormick, Fauquier county, Virginia, originally patented by him on the 28th of January 1826: December 1.

The claims must suffice to give all the information we can afford respecting this plough; they are to "the curved form given to the heel of the landside, and also the concave form given to its back edge as it rises from the heel to the beam. Also the manner of stocking the plough; likewise the cast-iron claevis, formed and attached to the beam, as set forth; that is to say, embracing the beam by its concave part, and having a ridge let into the beam, and the bolt inclined backward to resist the direct action of the draught."

396. For an improved *Machine for Sawing through Trees, &c;* Samuel H. Hamilton, city of New York, December 7.

This is an ingeniously contrived machine, intended, principally, for the purpose of sawing down trees, but which may also be adapted to the cross-cutting them after they have been felled. The machine is to be drawn from place to place upon two wheels. The saw is made stiff, as it has no straining frame, but stands out from the machine like a key-hole saw from its handle. The gearing by which it is driven is operated upon by means of a vertical wheel, which is turned by a winch. This acts also as a fly wheel, and is at the same time bevil-geared into a horizontal wheel which gives motion to the crank that operates on the saw. The frame of the machine is sustained, in front, upon a roller resting on a curved way, and this frame turns on a vertical shaft in the centre of the curvature of the way, allowing the frame, with the projecting saw, to move round, so that in the operation of cutting it may be made to bear continually against the tree; a weight hanging over a pulley serves to keep it up to its bearing. The claims need not be given, as they refer to the arrangement of the respective parts, as described.

Under particular circumstances, trees may, no doubt, be advantageously cut by such a saw; but for felling in the woods we do not look for any thing superior, or equal, to a good American axe and axeman. Such a machine as that described, cannot be moved about in the woods in a new country; and in most situations whilst it was being prepared, and anchored, the axeman would be able unaided, to complete the work. There are other serious objections to sawing machines for felling. The saw will bind in the kerf, in spite of all precautions; even the wind alone, were there no other cause, would frequently produce this effect. The axeman can always determine one of two ways in which his tree shall fall, but not so with the manager of the saw; and woe to his machine, when a tree falls upon it, an event which is not only possible, but very probable.

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397. For manufacturing *Boots and Shoes of India Rubber;* Stephen C. Smith, city of New York, December 7. (See Specification.)

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398. For improvements in the *Action of Piano Fortes, and in the mode of giving stability to such instruments;* Thomas Loud, city of Philadelphia, December 7.

Claim. "The improvement claimed, and wished to be secured by Letters Patent, in this modification of the action, (the front motion grand action) is the application of the jack, or grasshopper, immediately to the hammer block, with a front motion, or towards the centre of the hammer, together with the front regulation of the jack, or grass-hopper, when the jack is thus applied at once to the hammer block. And also in what I denominate my *metallic supporting brace*, in the turning pins or long block, of piano fortes, to form supports to the metallic plates by braces, tubes, or otherwise, for more than one point of its strain; the said supporting brace being continuous, either in one or more pieces, and being placed in, or attached to, the turning pin, or long block, to receive the strain from the metallic plate, arising from the tension of the strings, either by its touching the plate, or by braces or tubes attached to it in the manner, or upon the principle, herein fully made known; also, in the detached metallic plate, in the detaching of the plate from the back end of the case, except at the ends of the plate where it is screwed to keep it level."

399. For an improved mode of *applying heat to Cooking Stoves;* Jonathan G. Hathway, Painsville, Geauga county, Ohio, December 7.

This stove is generally to be constructed with two ovens, one above the other, and the fire compartment is to be over the upper oven. Sometimes, however, there is to be but a single oven, whilst the other parts which are depended upon as the foundation of a claim, are still retained. The novelty consists in the particular manner of conducting the draft through the flues, and of governing it by dampers. The claim made is to "the constructing of a cooking stove with the fire place in the upper compartment thereof, and the oven, or ovens, beneath the fire, and having the flues arranged and regulated in the manner set forth." The former part of this claim, that to the locating the fire above the ovens, is very old, and it is therefore only in its combination with the flues, &c., that it could be sustained. The destruction of the models and drawings in the Patent office, is a circumstance very often favourable to applicants for patents, as some thousands of obsolete devices have been thereby removed, without a vestage of evidence remaining of their ever having existed. Many patents are passed in the office respecting which there is a firm conviction on the part of the examiners, that they are taken for what is really old; but where this conviction is not such as would amount to positive testimony in court, the application is not refused.

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400. For an improvement in *Door Springs*; Thomas Thorpe, West Cambridge, Middlesex county, Massachusetts, December 7. (See Specification.)

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401. For an improvement in the mode of *Forming Blocks for Printing Colours on Silk, Linen, &c.*; John Crabtree, city of New York, December 7.

The object in view is to obviate the difficulty arising from the shrinking of the blocks, or from other causes whereby the mitre joinings of the patterns are rendered imperfect. The angle pieces are made in a solid block, upon which the corner pattern is formed, with its mitre. The same blocks may contain other portions of the pattern, so that other pieces for filling up will complete it. The claim is to "the forming of the angle blocks in one piece; and to the general arrangement resulting therefrom."

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402. For an improved *Parlour Stove*; Jordan L. Mott, city of New York, December 7. (The Specification of this stove will appear in the succeeding number.)

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403. For *Water Proof Mail Carriages*; Basil B. Pleasants, Brookville, Montgomery county, Maryland, December 7.

The patentee says, "I make the body of the carriage, or wagon, cylindrical, or nearly so, and construct it of metal or of straight pieces of wood, or staves, which are bound together by strong hoops of iron. There is a strong head let in at each end of the cylinder, in the manner of barrel heads; and on the outside of these heads I form suitable receptacles for the way mails, and for the baggage of the passengers. On the upper part of the cylinder I make an opening which is provided with a door, properly secured by hinges on two sides thereof, and rendered water tight when

closed, by surrounding the edge of the opening with india rubber, or other suitable material prepared for that purpose, so that when pressed upon by the door every interstice will be closed, and the admission of water, or any moisture, prevented. The body of the cylinder is to contain the great mail in its transition from one distributing office to another." This cylinder is to be supported on a carriage, provided with thorough braces, and other means of hanging it. The door is made capable, by the double hinges, of being opened on either slide. A seat is proposed for three or four passengers, and it has a gig covering; below this, in front, is a seat for the driver. The claim is to "the constructing of the body of the wagon, or carriage, in a cylindrical form, and having a door opening into it as described; a receptable at the end for the way mail or baggage, and the seat for passengers combined therewith; the whole arranged substantially as set forth."

This was one of several devices brought forward in consequence of a proposition from the General Post Office, to give a premium for the most approved mail carriage. Of the plans offered this alone sought the sanction of a patent, and there the matter is likely to rest.

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404. For a method of *Preserving Iron and Steel from Oxidation*; M. Sorel, Paris, France, December 7. (See Specification, p. 52.)

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405. For an improved mode of *Colouring and Finishing Leather*; Harman Hibberd, Utica, Genesee county, New York, December 15.

CLAIM. "What I claim as my invention is the using of the ferro-prussiate of potash in forming a black on leather; and also using sulphuric acid and nitrate of copper in colouring vegetable oils and varnishes to be applied to leather, without an additional body which would diminish their tenacity or lustre; likewise the application of heat, with cylinders, in the finishing of leather in the manner described." There is much empirical matter in the specification of this patent, and from this cause we are deterred from affording space for the whole of it on our pages, as we much doubt its proving the means of advancing the chemical, or the mechanical, arts.

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406. For an improvement in the *Water Wheel*; Charles Goulding, Mobile, Alabama, December 15.

This wheel, we are informed, is "to be driven by water power in such a manner as that the whole pressure of the water in the fountain is constantly pressing on buckets, or valves, on the periphery of a revolving cylinder, without allowing any part of it to escape until it arrives at the issues in the sides of the machine, thus driving these buckets, or valves, and cylinder around." The particular construction is then described, and a claim made to "the whole in the manner described." The granting of the patent goes to show that this wheel was supposed to possess some novelty, but is no guarantee for its utility. We are of opinion that by giving a particular description of it, we should render no valuable service either to the inventor, or the public; the attempts to cheat water out of its natural powers and rights is one of daily occurrence.

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407. For an improved *Cooking Stove*; Horace Gleason, Boston, Massachusetts, December 15.

"My invention," says the patentee, "consists in constructing a com-

pact and portable apparatus having all the conveniencies for cooking, to fit into and be heated by a common cylinder or upright stove, to be removed therefrom at pleasure, and placed out of the way when not in use, while the stove remains to warm the room. Thus enabling small families, and those who wish to use economy in rent and fuel to cook in their parlours or sitting rooms without the encumbrance of a common cooking stove."

The apparatus which is the subject of this patent may be made in various forms, but in all of them it has an opening through its bottom and top admitting a cylinder stove to stand within it; the interior of the stove thus constituting a part of the sides of ovens, or other cooking compartments.

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408. For an improvement in the construction of *Boot Trees*; David Hastings, Deerfield, Franklin county, Massachusetts, December 15.

The centre, or slide piece of the ordinary boot tree, is to be divided down its middle into two parts, and these two parts are united by hinges. On each edge of the slide is fixed a plate of iron the whole length of the boot tree, and about three inches wide, curved so as to fit on to the two sides between which the slide passes. There are some other appendages, and a claim is made to "the slide divided longitudinally, and connected together with butts; and the iron plates attached to the said slides in the manner described."

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409. For a machine for *Thrashing Clover Seed*; Jonathan Brooks, Brownsburg, Rockbridge county, Virginia, December 15.

This machine has a cylinder and concave between which the clover seed is to be hulled, or thrashed out. The concave is composed of slats extending from end to end, and of strips of sole leather confined between the edges of the slats, and projecting inwards towards the cylinder. The cylinder is grooved along so as to form it into twenty, more or less, beaters, between which and the leather of the concave, the seed is to be rubbed out. The claim is to "the concave of strips of leather in combination with a cylinder having beaters, constructed substantially in the way described."

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410. For an improved *Machine for manufacturing Wood Screws*; Clement O. Reed, Providence, Rhode Island, December 15.

In this machine the blanks to be cut are held in a revolving wheel; their heads being held in clamps around its periphery, and their shanks projecting out on one face of the wheel, parallel to its axis. The manner of holding them firmly whilst they are being cut is by the pressure of a roller against the jaws of the clamps. The threads are cut by dies upon a mandril, having a guide screw. The claim is "to the manner of feeding the machine by fixing the blanks to a revolving wheel, and thereby carrying them to the proper position for cutting the screw without stopping the machine, as set forth." The general principle, or mode of action, of the revolving wheel is claimed, when employed in such a machine, without limiting the claim to the particular manner of holding the blanks.

A machine for cutting wood screws was patented by Henry Crum, on the 14th November, 1836, in which the screws are held in a revolving wheel; but in this machine they project out around the periphery of the wheel in a radical direction.

411. For *Manufacturing Artificial Stone*; Joseph Woodhull, Wheatland, Monroe county, New York, December 15.

The materials to be employed, are prepared plaster of Paris, quick lime ground to fine powder but not slaked, oxides of iron, and of manganese, calcined by a full red heat; and the kind of iron ore denominated poor ore, or whites, calcined and reduced to fine powder. The proportions to be used are five parts of the plaster, two of lime, one of manganese, one of whites, and four of sand, all estimated by measure. These materials are to be well mixed in the dry state, the whole is then to have sufficient water added to adapt it for being put into suitable moulds; when this is done, stones broken small are to be added, until the mould is full. In from twenty to forty minutes the moulded material may be removed. Variagated marble is to be imitated by using suitable colours, and proper manipulation. For in-door purposes the metallic oxides may be omitted; for outside work the material is to be saturated with linseed oil. The claim is to "the combining together Plaster of Paris, lime, the oxide of manganese, the description of iron ore denominated whites, and sand, all previously calcined, and the whole prepared and managed substantially in the manner set forth."

There will thus be made a very inferior kind of scagliola; an article when well compounded and managed, of great utility and beauty; which is what we dare not predicate of the compound above described. The validity of this patent admits of much doubt, as the combination can scarcely be denominated new, in any respect; at all events, the right extends only to the particular composition as given, and whilst there are many others which are better, equally cheap, and not covered by any special claim, it is apprehended that the right will be of little value to the owner, whilst it will not stand in the way of any one.

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412. For an Improvement in the *Horizontal Water Wheel;* Samuel Curtis, Eagle, Alleghany county, New York, December 15.

Claim.—"Making the horizontal conical water wheel on a perpendicular shaft, and placing the buckets on the sloped sides thereof, in the manner before described; also the use of a leather tapering tube at the end of the tapering trunk, serving as a gate, or valve, for regulating the column of water passing to the wheel, by means of a lever pressing on the same, in the manner before described; also the second described gate, or valve."

We are not disposed to give any further description of the above-named wheel, or of its appurtenances, not being able to furnish any valuable information respecting it.

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413. For Improvements in the *Circumferentor;* James Mc Cann, New Market, Shenandoah county, Virginia, December 20.

The claims made are—"1st, The addition to the compass-box of a Nonius plate for allowing for the variation of the needle; and the method of using the same. 2d. The slides and hooks for securing the sights in a perpendicular position to the bar. 3d. The addition of the sliding sight. 4th. The combination of the counter with the circumferentor."

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414. For Improvements in the construction of *Trunks and Valices;* Matthias Steiner, city of New York, December 20.

The claims made are—1st. To the uniting the top and bottom frames, or

lid and body of the trunk by a metallic hinge, extending the whole length of the trunk, said hinge being riveted to the frames. Strips of metal are also to extend around the ends and front of the trunk, at the place of the joint. 2d. To forming a channel, or groove, within the thickness of the under side of the top frame, to receive a corresponding tongue on the upper edge of the lower part. 3rd. To a mode of securing the trunk by means of a screw-rod, which passes through overlapping staples in the top and bottom parts, and is turned by a kind of screw-driver, and is thus made fast.

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415. For a *Spark Catcher;* William Duff, city of Baltimore, December 20.

The smoke pipe of a locomotive engine is to have a cap somewhat in the form of a sugar loaf; its sides are to consist of a number of slats standing one above another, like the slats of a venetian blind, at an angle of about 45°. This slope is to throw the sparks downwards as they escape from the chimney, which is surrounded by a second cylinder, a small distance from it, allowing space for a receptacle. This outer cylinder flares out at top, and is covered by a cap of wire-gauze. The inside of the flaring part of the jacket has straps of metal around it, arranged also in the manner of blind slats, to arrest any sparks which might tend to ascend.

"I claim the venetian screen made so as to cover the smoke pipe, and throw the sparks downwards; also the application of the strips on the inside of the top of the jacket, which prevent any substances from passing up the sides of the jacket; all applicable to locomotive engines to arrest sparks and extinguish them, and to cause a draft in the chimney; and the application to ordinary chimneys to cure smoking, and to produce a draft in them."

That a draft will be caused by such a contrivance is rather a novel idea; but if it will do this, and cure smokey chimneys, it might be worth while to put several upon some chimneys, to insure success.

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416. For an improved *Floating Dry Dock;* John Thomas, city of New York, December 20.

Claim.—"Having thus fully described the construction of my Floating Dry Dock, and the manner of using the same, I do hereby declare that I do not claim as my invention either of the separate parts thereof, taken individually; nor do I claim the application of floats or trunks from which water is to be pumped out for the purpose of lifting vessels for repair, this having frequently been done; but what I do claim is the making and using the smaller, or end trunks, or floats, which are to be used in combination with the main floats, and are not to admit water, but are to be forced down as the dock with its load rises; the whole combined and operating substantially in the manner, and for the purpose herein set forth."

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417. For an improvement in the mode of constructing *Force and Suction Pumps;* Jonathan Stevens, Newark, N. Jersey, December 20.

There is a peculiarity in the manner of arranging two side pipes, with their valves, alongside of a metallic cylinder, and the claim relates, and is confined, to this arrangement, which does not present any thing new in principle, or which can be advantageously applied to pumps in general.

418. For *Machinery for Spinning Tobacco;* Hiram M. Smith, Richmond, Virginia, December 20.

"My invention consists in the application of what is usually denominated a clutch, to the end of the common spool used in spinning tobacco, to be removed whenever its motion is required to be checked or stopped; and in providing a friction lever, and making the same in combination with the lever and with the clutch; thereby enabling the spinner, at any point in the spinning table, by the single operation of sliding a small rod, which may be done with the thumb and finger, to remove the clutch and apply the friction lever to the end of the spool, and by this means prevent the spool from continuing to revolve after the clutch is removed, which it would otherwise do for some length of time, from the momemtum given it in spinning," &c. &c. The claim is to the combination of the clutch, the friction lever, and the spool, in the manner described.

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419. For a Machine for *Hulling Clover Seed;* William M. Barton, Cheek's Cross Roads, Hawkins county, Tennessee, December 20.

A wooden disk is to be placed on the upper end of a vertical shaft, and is to have its upper surface furrowed like a mill stone; this constitutes the runner. Above it is a platform of wood, supported on a frame like a table top. The under side of this platform is to be furrowed like the runner. There is a hole in the centre of a platform, which is surmounted by a hopper for feeding the seed to be hulled. Means are provided for causing the runner to revolve; and also for regulating its distance from the platform. This constitutes the whole machine. The claim is to the "making the runner and cap out of wood, and furrowed in the manner above described."

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420. For a Machine for *clearing Burrs from Wool, in the skin;* Erastus Tracey, Poughkeepsie, Dutchess county, December 20.

The skins with the wool on, as imported from South America, are filled with burrs from which it has hitherto been found difficult and expensive to remove them, but with this machine it is said to be readily and perfectly affected. A cylinder is made about two feet in length, and one foot in breadth, and upon this are placed several rows of steel teeth, about an inch long, and an eighth of an inch apart. This cylinder is made to revolve with great rapidity, and the skins are fed up to it by means of a feeding apron passing around rollers, one of which is nearly in contact with the revolving cylinder, and has above it a pressing roller, to hold the skin firmly. The endless apron, with its appertenances, is on a separate frame, which is made to approach, or recede from, the revolving cylinder by means of a rack and pinion. The skin is laid on the revolving apron, and carried forward so that one-half of it hangs down from beneath the pressing roller; it is then moved up so as to be acted upon by the revolving cylinder, and drawn back on the revolving apron, until the first half has been cleaned. The skin is then turned end for end, and the operation completed. The claim is to "a machine having a revolving cylinder furnished with teeth to which the skin, placed upon an endless apron is fed up, and operated upon, as herein set forth."

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421. For an improved *Machine for Sawing Staves;* Harvey Holmes, New Marlborough, Massachusetts, December 20.

This machine is to cut the staves lengthwise of the grain of the wood.

For this purpose, a wheel, the circumference of which has the curvature of the stave, is to be fixed on a vertical shaft, and made to revolve by any adequate power. Steel teeth are to be fixed around the periphery of this wheel, and are to project downwards below its lower edge, and they are to be curved in their length in such manner as to adapt them to the curvature of the stave widthwise. This constitutes the saw. The stuff is to be fed up to this by suitable apparatus below. Instead of making a perfect wheel, it is proposed sometimes to make segments only, for cutting the staves.

"What I claim as my invention, is the construction and use of a wheel, or segment, or segments thereof, which wheel, or segment, shall have a radius the same, or nearly the same, with that of the stave to be cut, taken longitudinally; said wheel having teeth on its periphery, which are to be bent lengthwise, so as to cut such stave to the proper curvature transversely."

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422. For an Improvement in the *Cooking Stove;* James Hutchinson, Jr., Lynn, Essex County, Massachusetts, December 20.

The claim refers only to a special arrangement of the dampers and flues, which was viewed as sufficiently novel to pass examination, but which is not of a character to justify a long story.

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423. For an Improvement in *Secret Safety Locks;* William Hobbs, Springfield, Hampden county, Massachusetts, December 20.

This is a contrivance intended to be used, principally, on hasp locks for trunks; it consists in a particular manner of shifting the hasp laterally, and of managing the key in turning it; the device is ingenious, and one which may serve to please the curious, and to induce the sale of a number of trunks; but we do not think it necessary to employ the engraver to represent it.

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424. For an Improvement in the *Thrashing Machine;* Alexander W. Bowling, Front Royal, Warren county, Virginia, December 20.

The principal improvement claimed in this machine is in the mode of putting the parts together, and of holding them firmly in place; a point of very great importance, and which is not sufficiently attended to in most of these instruments. The centrifugal force arising from the very rapid revolution of a thrashing cylinder, has occasioned much maiming, and, in several instances, loss of life. The mode of construction here proposed, is well calculated to insure strength. There are some minor points in this machine which are claimed as improvements.

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425. For Improvements in the *Machine for Grinding Grain;* Oliver Wyman, East Cambridge, Massachusetts; originally patented July 1, 1836. December 20.

The runner of this grist mill is in the form of a frustrum of a cone, with the base downward, and this is enclosed within the stationary stone, which consists of two parts confined together by screws. The runner, as described in the first patent, had a bridge tree below it, upon which the spindle rested. In the improved form, the stone is suspended by the spindle from a bridge tree above it, the spindle being jointed to allow it to play, and having a collet on it which rests in a cup on the upper surface of the bridge tree. The claim made is to the "suspending the runner of the patented mill, from a bridge-tree above the stone, by means of the combination described of rings, key, and pin, by which the runner can accommodate itself to the bed in the most exact manner."

426. For an Improvement in the *Machine for cutting Dyewood and Bark;* Abner McMillen, Bedford, Hillsborough county, N. Hampshire, December 26.

The patentee says, "I am aware that dyewoods have been reduced by circular saws, and other machinery operating on the end of the stick, applied in various ways, but what I claim as my invention, and consider as new in the above described machinery is the construction of the carriage in combination with a cylinder of cutters and a depressing roller, constructed and operated substantially as herein described."

427. For an Improvement on the *Truss for Hernia*; Josiah Hungerford, Dover, Dutchess county, New York, December 26.

The claim is to a particular mode of reversing the pad, by means of oblique mortises; the mode of connecting the pad to the spring, and of adjusting it in its place. There is but little novelty in the contrivance, and nothing to render this superior to many other trusses.

428. For an Improved *Steam Generator;* William Creed, Boston, Massachusetts, December 26.

This is a vertical, tubular boiler, the outer case of which is a double cylinder, with water between them. The tubes above the furnace rise vertically and terminate in a drum from which the smoke pipe issues. The claim is to the "constructing two or more tubes in sets, of one piece, uniting at their upper end in a common orifice, where they are connected with a drum terminating in a smoke pipe; the whole being constructed, combined, and arranged substantially in the manner described."

429. For an Improvement in the *Safety Rail Road Car;* William Kinkead, Elkton, Cecil county, Maryland, December 26.

The claims are to a "method of sustaining the car in case of the breaking of the wheels, axles, &c. in the manner described. And to the manner of constructing the safety hooks with joints or hinges, screw rod and nut, so that said nut can be engaged with, or disengaged from, the centre guide bar, or safety rail, with great facility and despatch, in case of any trivial accident which might arrest the progress of the cars, or in case it might be desired to turn out of the main track."

This is an *improvement* in rail roads such as is frequently devised in the parlour, but which never finds its way on to the track, and which, were it placed there, would prove to be but a transient lodger. A third rail is to be laid in the centre between the ordinary rails, and is to extend up nearly to the bottom of the cars; there is to be a plate on this rail, forming it into a T rail, and from the bottom of the car hooked pieces are to descend, and clip under the top of the said T plate. Rods reaching into the car act upon and withdraw these hooks, when necessary. Should a wheel, &c., break, the car is to rest on the centre rail, and should the car tend to leave the track, the hooks and safety rail are to prevent it.

430. For a *Ready Binder for binding Newspapers, Sheets of Music, Letters, &c.;* Ezra Ripley, Troy, Rensalaer county, N. York, December 26.

There are two flat pieces of wood, like flat rulers, which are to hold the back edges of the sheets between them. These are acted upon by springs,

simply and ingeniously arranged, se as to produce the desired effect in a very perfect manner. To give a clear idea of the arrangement of the springs, &c. would require a drawing.

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431. For Improvements in *Fastenings for Window Blinds and Shutters*; Elijah Jaquith, Brattleborough, Windham county, Vermont, December 26.

These fastenings are of very doubtful originality, as a number of devices for the same purpose have been patented; a hundred modes of making them, probably, had been the subject of patents, and were removed out of the way of re-inventors by the burning of the office. In its general form, and mode of action, the present fastening does not differ from others, long in use; the only claim made being to the form of the spring which acts upon the catch, which spring is coiled and inserted, like that used in common snuffers; so far as appeared in the office, this was a new combination in the blind fastening.

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432. For an Improved *Separating Link for connecting Rail Road Cars*; C. H. Hunt, and W. Brown, Fredericksburg, Virginia, December 26.

The principal object in view in the construction of this link is, "in case of the engine, or a car of the train, being thrown off the track, for becoming instantaneously disengaged, leaving the remaining portion of the train on the track." The instrument appears likely to answer the intended purpose, and therefore, in some instances, to be of utility; it rarely happens, however, that in the case of a locomotive, or a car, leaving the track, it will itself be removed out of the way of those behind it.

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433. For an Improved *Standard Measure for taking measure for Coats*; Erastus Barber, Boston, Massachusetts, December 26.

This instrument is more simple in its construction than most of those which have been devised for the same purpose, and from this cause, appears to us better adapted to the intended use; in venturing such an opinion, however, it ought to be confessed that it relates to a matter in which we have no learning, and but little judgment. The claim is to "the above described standard measurer constructed so that all the points required in the fitting of the body are obtained from one vertical line, as set forth. Also the fixing the standard measurer firmly in its place by means of straps, or otherwise, thus insuring correctness in operation, notwithstanding the moving about of the person who is being measured."

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434. For an Improvement in the construction of *Locomotive Engines;* Samuel Wright, Philadelphia, December 26.

We expect to obtain a cut of the improved locomotive, which, when ready, will be given with the specification.

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435. For an Improved *Sliding Flue Grate*; Daniel Desmond, city of New York, December 29.

The claim made is to "the drawing out of the flue with the grate, so as to preserve an equally good draught, and yet adapt the grate to the purpose of cooking, or giving out heat into the room."

An open grate is set in a fire place so that it may remain flush with the

front, in the usual manner. Above it is a stationary oven, around the bottom, back, and top of which the flue passes, there being doors in front opening into the oven. The grate may be drawn out, and project far enough from the oven to have boilers placed in openings directly above the fire. A sliding flue is attached to the grate, and passes into that under the oven, preserving the continuity of the draught, whether the grate be shoved in, or drawn out.

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436. For Improvements in the Machine for *Thrashing and Cleaning Grain;* J. A. and H. A. Pitts, Winthrop, Kennebec county, Maine, December 29.

This machine is constructed in the thrashing part like many others; it is combined with a winnowing machine, as has repeatedly been done, and the things claimed are certain special matters and the mode of combining them.

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437. For an Improvement in the *Cooking Stove;* Carrington Wilson, city of New York, December 29.

The claim is to "the plan of carrying the flues up the remote corners of the body of the stove by diagonal plates, and the arrangement, so far as connected with this object, by which the stove is rendered much more compact, and the dimensions of the oven proportionably enlarged."

It will be seen from the foregoing that the only novelty claimed is in the peculiar form given to certain parts of the stove.

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438. For an Improvement in the mode of making *Harness from metallic Heddles, for Weaving;* B. Hartford and W. B. Tilton, Enfield, Grafton county, New Hampshire, December 29.

Instead of the cord usually employed in making the harness, it is to be composed of strips of metal, with eyes made through them for the passage of the yarn.

"What we claim as our invention and desire to secure by letters patent, is, first, the above metallic heddles, formed in one entire piece, with holes therein to admit the weft, and for their support upon the rods, as above described. These heddles are made of tin, or of wire that has passed between rollers to give it the required width and thickness. Second, we claim the heddles with holes fitting closely to the rods on which the heddles are placed. We claim the heddle frame, constructed substantially as described." The rods above referred to are two parallel rods of round iron at the top and bottom of the harness frame, the metallic heddles having holes at each end by which they are connected to the rods.

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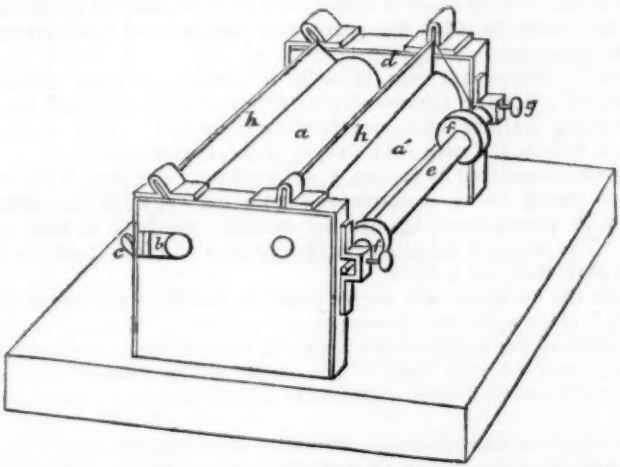
439. For *Fastenings for Saddle Bags, Mail Bags, &c.;* Alvin North, New Britain, Hartford county, Connecticut, December 29.

The claim is to the method described of making the hasps of saddle bag fastenings, and other articles. This is a very trifling affair, and it would be a difficult task to place its merits on record.

Specifications of American Patents.

Specification of a patent for a machine for sizing paper; granted to John Ames, Jr., *Springfield, Hampden county, Massachusetts, December 1st,* 1837.

To all persons whom it may concern, be it known, that I, John Ames, of Springfield, in the county of Hampden, and Commonwealth of Massachusetts, have invented a new and useful improvement in the method of sizing paper by machinery, called a sizing machine, of which the following is a full and exact description.



At a convenient height, I place two cylinders in a horizontal position, and parallel to each other, turning on their respective axes. See, *a*, *a'* in the drawing. I make one cylinder, *a*, of metal, about five and a half feet long, and about nine inches diameter, with a polished surface—the other *a'* of wood, of the same length, but of a diameter sufficient to keep it from springing; and consequently, the diameters of the cylinders may vary in due proportion to their length in all cases. One of the cylinders rests on movable boxes, *b*, which are regulated by screws *c*, or levers, which are so adjusted as to carry the cylinder that they act upon into close contact with the other cylinder when operating.

The paper is brought in a continuous sheet from the paper machine, over a cylinder whose axis is parallel to the axes of the other cylinders, and which is elevated above the others, and so placed that the sheet descending perpendicularly, passes between the first named parallel cylinders—the motion of the cylinders being such as to carry down the paper between them.

That part of the descending surface of each cylinder above their line of contact forms with the descending sheet a trough for the sizing. The ends of the sizing cylinders run against a flat surface, *d*, making a joint close enough to prevent the escape of the sizing.

These troughs are filled, or nearly so, with the sizing prepared in the usual way.

In order to keep up the supply in the troughs, I place a vat, or cistern, containing the sizing in a position higher than the sizing cylinders, having tubes, discharging the requisite quantity into the troughs. Beneath the sizing cylinders, is placed a trough to receive the sizing that passes down between the cylinders at places not in close contact, and it is pumped back into the upper trough, or into the cistern.

By means of the dripping, the edges of the sheet are sometimes, especially in cold weather, apt to be smeared by the sizing. To prevent this I put a strip of fine linen or thin silk around the wooden cylinder *a'*, (when one is used) where the edges of the sheet pass.

These strips serve to make a closer joint, and prevent the escape of any sizing near enough to touch the edges, after passing and being pressed between the cylinders.

If metal cylinders are used, in order to obviate the same difficulty, I place near to the outer surface of the cylinder, which leads off the paper from the sizing machine, and corresponding to its axis, a shaft, *e*, on which are placed wheels, *f*, *f*, with rims two, or three, inches wide.

This shaft is regulated by screws, *g*, or by a lever. The rims of the wheels, which are placed so as to correspond with the edges of the sheet, are pressed with proper force against the cylinder, which turns them by the friction. The edges of the paper are thus pressed and freed from the sizing that may have attached to them.

To clear the cylinders and enable them to present a smooth surface to the sheet, I place upon each a scraper, *h*, *h*, called a "doctor," made of a strip of wood of the length of the cylinder, with an edge of about half an inch thick, covered with cloth. The edges of the doctors are pressed upon the cylinders with force sufficient to scrape off any scurf that may adhere.

What I claim as new and as my invention is the combination of the several parts of the above described machine, in the manner specified, for the purpose of sizing paper without the use of felting, or jackets.

JOHN AMES.

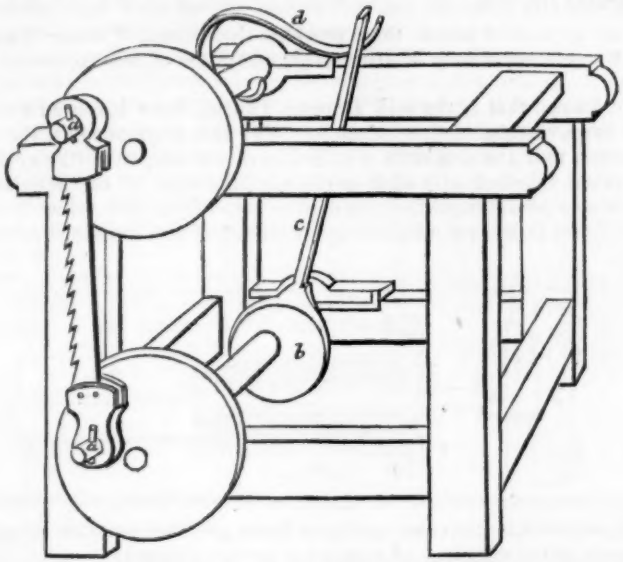
Specification of a Patent for Improvements in the mode of constructing Saw Mills; granted to JOHN AMBLER, Jr., *city of Philadelphia, December 1st*, 1837.

To all whom it may concern, be it known, that I, John Ambler, Jr., of the city of Philadelphia, and state of Pennsylvania, have invented a new and improved mode of constructing Mills for sawing timber; and I do hereby declare the following is a full and exact description thereof.

Instead of hanging my saw by means of a frame and fender posts, or by means of vibrating levers arranged in any of the various ways heretofore practised, I provide two shafts which are placed in a suitable frame, one over the other, and at such distance apart as shall correspond with the length of the saw to be used; and on one or both ends of these shafts, I form cranks, to which the two ends of the saw, or saws, are to be attached by means of metal blocks affixed on each end of the saw, said blocks having sockets to receive the ends of the cranks.

The accompanying drawing represents such a view of my mill as will serve fully to illustrate the construction and operation thereof. The cranks

a, *a*, are shown as connected to revolving, or vibrating, disks, or wheels, but they may, instead of wheels, be simple cranks, of the ordinary form.



The crank pins may each be at equal distance from the centre of their shafts; in which case, both of the crank shafts are intended to make a complete revolution at every stroke; the length, or throw-out, of each crank should, in this case, be about four inches, but it may be more or less; it being intended, however, in my mill, always to feed, or cut, less at each stroke than with the ordinary mill saw, and to give a more rapid motion thereto.

I do not intend, in general, to make both the cranks of one length, but to give a throw-out to the upper, of from five to eight inches, and to the lower, from three to six inches; the consequence of which will be that when the lower shaft is made to revolve by the application of any suitable power, the upper will vibrate backward and forward, performing a part of a revolution only, the extent of which will be determined by the relative lengths of the cranks. To keep the saw on a strain, I fix a spring, or a weight, so that it shall act upon the shaft of the upper crank, so as to draw it round from the saw. A spring is to be preferred to a weight, in this case, as any desired degree of tension may be given to it.

The spring may be fixed in various ways, so as to produce the desired action, but in all cases it should be so connected and arranged as that the greatest tension should be given to the saw at the period when it is rising. One method of effecting this is shown in the drawing.

An eccentric, *b*, is placed upon the lower shaft, and surrounded by a hoop, from which the rod, *c*, ascends, which rod is attached to the outer end of a coiled, or curved, spring, *d*, the inner end of which is fastened to the upper shaft.

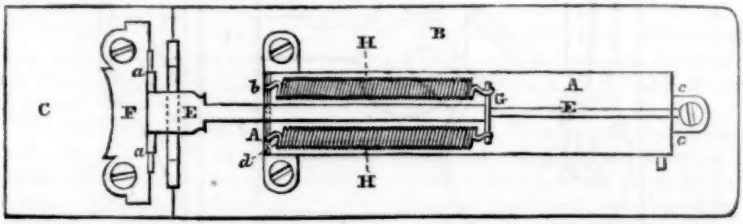
What I claim as my invention, is the hanging of Saw Mill Saws upon rotating, or vibrating, cranks, substantially in the manner herein described.

JOHN AMBLER.

Specification of a patent for an improvement in Door Springs; granted to THOMAS THORPE, *West Cambridge, Middlesex county, Massachusetts, December 7th,* 1837.

To all persons to whom these presents shall come, Thomas Thorpe, of West Cambridge, county of Middlesex, and State of Massachusetts, sends greeting.

Be it known that I, the said Thomas Thorpe, have invented a new and useful improvement in door springs. The said improvement, the principle thereof, and the modes in which I have contemplated the application of the same, together with such parts, combinations, or characteristics, by which it may be distinguished from other inventions, and which I claim, I have fully set forth in the following specification and drawings referred to therein.



A, A, represents the outer casing of brass, or other suitable metal, shaped as seen in the drawing, or otherwise properly formed.

B, is the door on which the spring is to be fastened; C, the door frame.

E, is a metallic rod, turning on a hinge at *a*, in the side of the piece of metal F, screwed to the door frame. The rod E, passes through holes in the ends, *b*, *c*, of the casing A, moving freely back and forth in said holes. G, is a cross bar attached to the rod E, in a proper manner, and has connected to each extremity the end of a wound spring, H, H, whose opposite end is confined to the end *b*, of the casing, or to a pin *d*, passing through the sides thereof.

When the door is opened, the springs H, H, are extended by the movement of rod E, through the slots in the ends *b*, *c*, of the casing, and in withdrawing the force applied to open the door, the springs contract, and immediately close the same. Instead of two springs, I may use only one, or I may employ three, or more, should it be deemed advisable.

The main advantage of this spring consists in the exertion of a strong force to close the door, when nearly shut. Other kinds of door springs generally fail in this part of their operation.

I claim as my improvement, the above arrangement of springs, acting on a rod E, and operating in the manner above described.

THOMAS THORPE.

Specification of a patent for manufacturing Boots and Shoes of India Rubber; granted to STEPHEN C. SMITH, *city of New York, December 7th,* 1837.

To all whom it may concern, be it known that I, Stephen C. Smith, of

New York, in the county of New York, and State of New York, have invented a new and improved mode of manufacturing boots and shoes of sheet india rubber, and I do hereby declare that the following is a full and exact description of the process of manufacture.

A cloth, or leather, lining is fitted to the last, and sewed, or cemented, to an insole of leather; over this are then spread with a brush, two or three coats of dissolved india rubber, to render it sticky; the sheet rubber is then cut into the proper shape, and two or three coats of dissolved india rubber spread on one side of it; the sheet rubber is then put on to the cloth lining and rubbed down; the cement on it causes it to adhere to the cloth, a sole of leather, or of india rubber, is then cemented to the bottom—the boot, or shoe is then taken from the last, bound round the top, blacked, and is ready for use.

What I claim as my invention, and desire to secure by Letters Patent, is the making of Boots, Bootees, Shoes, Overshoes, and Slippers, of sheet india rubber, in the manner herein described.

STEPHEN C. SMITH.

English Patents.

Specification of a patent granted to NATHANIEL PARTRIDGE, *county of Gloucester, for his invention of a certain improvement or certain improvements in mixing and preparing oil paints, whereby a saving of ingredients commonly used will be effected.*—[Sealed 8th December, 1836.]

This invention of a certain improvement or certain improvements in mixing and preparing oil paints, whereby a saving of ingredients commonly used will be effected, consists in the application and use of solutions of lime in water, in the mixing and preparing of oil paints, for the purpose of thickening or preparing the oils used in the same, and forming a better vehicle for the various pigments or paints, and at the same time producing economy in the various ingredients commonly used in the mixing and preparing such paints, (that is to say) instead of using oil only in the customary manner as a vehicle for the various pigments or paints, I first saturate rain, soft, or distilled water with lime, and when in a pure state of solution, that is, after that portion of lime which the water will not take up has subsided, and the water remains clear, it will be fit for use.

For preparing paints for the useful arts, I first mix the said lime water with oil in about equal parts or proportions, by placing the same in a proper vessel, and agitating them till they are united or commixed, in which state the combined oil and lime water will resemble thick cream, in consistency. To about two parts of this composition of lime water and oil I add about four parts of ground white lead, by mixing and preparing them in the usual manner. Should the paint made with this proportion of the composition be found too thick, it may be reduced or thinned by adding small portions of oil, when spirit of turpentine is not mixed therewith, as in paint used for out-door work. But when turpentine is used as for in-door work, the paint may be reduced or thinned with turpentine, only without the addition of any further quantity of oil.

For what is called by the painters flatting the works, or for the last coat put on, I mix about four or five parts of the composition of oil and lime

water, with about eight parts of spirits of turpentine, and add thereto as much ground white lead as the workmen may think necessary in order to make the paint for the last or flatting coat of the proper consistency.

I may here remark, that this flatting coat will not only be put on with less trouble, but will also be found more perfect and durable than when turpentine alone is used. Should the workman wish to lay on a thicker coat of paint, he may add more white lead. For wall painting, the walls should be oiled over before the paint is put on. It may be observed, generally, that in all cases where turpentine or dryers are used with this composition of lime water and oil, a less proportion of them is necessary than when oil alone is used; and that if sugar of lead be used as a dryer, it may be dissolved in the lime water before being mixed with oil, when being in a state of pure solution, it will be found advantageous to the colours.

It is proper to notice that Prussian blue, and some of the dry absorbent earths, such as ochres, umbers, or any other colour that may be found not to grind well in the composition, ought to be first ground in equal parts of raw and boiled linseed oil, or boiled linseed oil only, as may be required, to about the thickness of white lead, as usually prepared, and then to be mixed up for painting with the composition. And further, that I have found the following to be a convenient manner of preparing the solution of lime water; that is to say, to about twenty gallons of cold soft water (or if it be distilled the better,) apply three or four pounds of fresh burnt lime, put them into a cask, stir it well about, and let it stand about twenty-four hours, or until the water is quite clear, when it may be drawn off as wanted; it should be stirred up every six or seven days, that the water may be kept fully impregnated with the lime; and that a convenient mode of mixing the lime water with the oil, is by placing the proper proportion in an open vessel, as a tub or bucket, and whisking or beating them well together; or place the same in a bottle or jar and shake them together until completely blended; and further, I would remark, that the mixture of lime water and oil should always be well shaken before being mixed with the pigments: the lime water should be kept from the air, and as cool as possible.

For preparing my improved paints for the fine arts, the colour should be ground in such proportions of oil and lime water, as may be found requisite, as the exact proportions cannot be stated, as they vary according to the nature and quality of the materials used; but it is desirable to incorporate as much lime water as possible, in order to render the paints crisp, or short, to the touch, and transparent. When sugar of lead is used as a dryer, I dissolve it in the lime water, which I consider an improvement.

For preparing a composition, or what is called by artists "maguelph," for the purpose of thinning the paints or colours on the pallet, I mix the lime water and oil together, and then add a little mastic varnish; the more lime water which can be incorporated, the thicker and crisper, or shorter, will be the composition.

Having now fully, and particularly, described the nature of my said improvements, and the manner of carrying the same into effect, I wish it to be understood that what I claim as my invention, and secured to me by the above in part recited Letters Patent, is the application and use of solutions of lime in water, or a composition of lime water and oil, in the mixing and preparing of oil paints for the useful and fine arts severally, such invention being new, and never before used within these kingdoms, to my knowledge or belief.—(*Inrolled in the Rolls Chapel Office, June*, 1837.)

Specification of a Patent granted to WEBSTER FLOCKTON, *of the county of Surrey, for improvements in Preserving Timber from Decay.*—Sealed August 3, 1837.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Webster Flockton, do hereby declare the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof (that is to say:—)

My invention consists in impregnating timber of various descriptions with a metallic solution, whereby such timber will be preserved.

And I produce the necessary solution in the following manner, which I consider the best and cheapest means of carrying my invention into effect, though I do not confine myself to the precise means hereafter described, as variations may be made; my object being to impregnate timber for any purpose, it may be found applicable with a metallic oxide, as above stated, and as is more fully described hereafter.

In order that my invention may be fully understood and carried into effect, I will describe the method I pursue of combining materials together and applying them to the purpose aforesaid. I take a quantity of tar (either Stockholm, Archangel, or American) which I submit to the process of distillation; and the apparatus, or still, which I use for this purpose is similar to what is called a pitch still, which is made of copper, and is well known, and forms no part of my invention, nor does the process of distillation for separating the essential oil from the tar, which is effected in the manner following. The still which I use will contain about four hundred gallons, but I do not put into it more than three quarters of that quantity of tar of either of the kinds before mentioned. The first product will be the acid of the tar, bringing with it a light coloured essential oil, which separates immediately and floats upon the surface of the acid in the receiver, which I prefer of wood (a cask with one head and furnished with a cock for withdrawing the acid from below being applicable to the purpose.) After some time the acid will cease and the essential oil will come over in a very considerable stream, which I collect from the receiver to the extent of about forty-eight gallons in the whole, including that which came over in the first instance with the acid. The fire is then to be withdrawn and the contents of the still, which by the extraction of the essential oil, has become pitch, allowed to remain in the still until the following morning to cool, when it may be let off by means of a pipe fitted with a brass or iron plug into a large receiver of cast-iron or other suitable material, and finally put into casks for sale.

I will now proceed to describe the combining of the essential oil with the other materials for the making of my "metallic solution." To effect this, I place two or more large casks upright, removing the upper head of each, and throw into them well rusted iron hoops or tin cuttings. I then pump into them one hundred gallons or more, according to the size of the casks, of the essential oil of tar before described, completely covering the metal. This oil I cause to be repeatedly pumped every day from one cask to the other for about six weeks, by which time the oil will have become very black and much increased in gravity, whilst the iron hoops or tin cuttings will appear quite bright and free from oxide. They are then to be taken out and piled up in an open space of ground and set fire to for the purpose of burning off the oil, and afterwards laid by for re-oxidation,

which may be much facilitated by pouring over them a weak solution of common salt and water. When they have been rusted they will be fit for use.

I will now proceed to describe the method I pursue of saturating timber with the metallic oxide. For saturating wooden piles already driven into the sea, forming jetties or piers, I cause an inch auger to be passed down the centre of the piles to the bottom end if possible, or as far down as can conveniently be done, and the "metallic solution" poured down the hole until filled. This is to be repeated as often as may be thought necessary, but generally in a day or two, it will be found oozing through the pores of the wood depositing an incrustation of iron, which, in combination with the essential oil of the tar, resists alike the action of the water, and the attacks of the worm. A wooden plug or tree-nail is to be driven fast into the hole which may be removed by the auger at any time for the purpose of giving the piles a fresh supply. This method is likewise applicable to the wooden sleepers of railways, and in short to all timber, subject to damp or moisture or the attacks of worm or other vermin.

For out-door buildings, liable to dry rot, it is to be used cold, in the usual way of tar or varnish, with a brush; for being perfectly liquid, it penetrates most rapidly, drying completely in eight or ten hours, when a second dose may be given. Applied to the framing and joists of houses they will be effectually preserved from decay, or where dry rot has in any shape made its appearance, so as to be within reach of applying the solution, perfect soundness will be restored to the infected timbers with a total extermination of fungus.

Having thus described the nature of my invention, and the means of carrying the same into effect, I would have it understood that I lay no claim to any of the materials separately, and it will be evident that the means of carrying the same into effect may be varied to suit the particular object to which the invention is to be applied. But I would have it understood that what I claim, is the impregnating timber of various descriptions with a metallic solution (such as I have described) whereby such timber may be preserved.—In witness whereof, &c.

Enrolled February 3, 1838.

Reper. of Pat. Inven.

Specification of a Patent granted to Robert Whitfield, *of the county of Surrey, for a composition which he denominates an indelible, safety, and durable black fluid writing ink.*—[Sealed 14th November, 1837.

This invention merely consists in combining a very long list of ingredients in different proportions, most of which are highly combustible, and then setting them on fire by means of a red-hot iron rod, and collecting that portion of them which in the act of combustion would otherwise escape in the state of smoke, and become soot, and also collecting the residuum of the burning operation which is afterwards to be ground up into an impalpable powder, and when mixed with some liquid ingredients, hereafter named, will produce a fine indelible black ink, which the Patentee informs us cannot be extracted from paper, parchment, &c. by any acids or chemical processes whatever, without materially injuring the texture of the material subjected to such a process.

The principal ingredients employed by the Patentee in making the beforementioned mixture to be subjected to combustion, are the following, and

they are mixed or amalgamated in various proportions; viz. linseed oil, cocoa-nut oil, Venice turpentine, bullock's blood, loaf sugar, seed-lac, gum arabic finely pounded, linseed and pounded cotton seed, finely purverized charcoal, pomegranate peel, Aleppo nuts, gum kino, solution of India rubber, the very best molasses, or treacle, parchment shavings, ocre seed, burnt horns, the best ivory black and Antwerp black, tartar, Indian borax, cyanuret of potash, a quantity of the best glue finely pounded, Arcadian nuts, and walnut shells. These materials are intimately mixed together in a large iron vessel, and boiled for about ten minutes; the whole mixture is then set on fire by stirring it about with a red-hot iron, and allowed to burn till all the oil is consumed. The smoke arising from the combustion of this mixture is collected in a conical-shaped vessel, which is inverted over it; this vessel is to be made of the very best sheet iron; it will then be found that the smoke will become condensed, and deposit itself in the shape of soot on the side of the conical vessel: and when all the oil is consumed by the combustion, the product, or that which is found in the conical vessel, must be carefully collected, and put into jars; and that part of the ingredients which remains in the iron boiler, or caldron, and which will be found adhering to the sides of the vessel, must be scraped off, and ground upon a stone until it becomes an impalpable powder.

The products thus obtained must be mixed with some liquid materials in about the following proportions:—to one pound of the products above-mentioned, add one quart of the very best French vinegar to about one gallon of hot water, a small quantity of finely powdered gum arabic, and an equal quantity of gum lac; to these must be added a few Aleppo galls, and a small quantity of logwood chippings. The whole of this must be boiled for about ten minutes in an iron vessel, and then poured out into shallow iron vessels, and be allowed to remain for three weeks exposed to the atmosphere.

The patentee says, in conclusion, "I do not mean or intend to claim the exclusive use of any of the materials herein set forth, nor do I intend to confine myself to the exact proportions of combining them, as the same may be beneficially varied; but what I claim as my invention, is the producing an indelible black ink from the products above named, or from the greater proportion of them combined with the liquid ingredients, as above described."*

Jour. Arts & Sciences.

Specification of a Patent granted to EDMUND SHAW, *of the city of London, Stationer, for an Improvement in the Manufacture of Paper, by the application of a certain vegetable substance not hitherto used for that purpose.*—[Sealed September 14, 1837.]

To all to whom these presents shall come, &c. &c.,—*Now know ye*, that in compliance with the said proviso, I, the said Edmund Shaw, do hereby declare the nature of the said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof (that is to say):—

I take the envelopes or leaves which cover the ears of Indian corn, and put them into a vessel containing water. The water may be pure, or slightly alkaline, or acid; I then boil the water in the vessel, either by steam or

* The above patent is extracted mainly as a matter of curiosity and absurdity.

fire heat, and macerate the aforesaid envelopes or ollicular leaves. When they have imbibed water and become thickened and swollen, so that the matter interposed between the fibres is reduced to a state of pulp or jelly, a slight beating by a fulling mallet, or other mechanical means, will effect a separation of the fibre from the adherent glutinous matter, and washing or rincing with water during the beating, will cleanse it entirely from the glutinous matter.

I bleach the fibre produced as above, by immersing, or immersing and beating or stirring it about in a solution of chloride of lime, or with beating engines, as it is at present practised for the bleaching of rags in paper mills, and the fibre is in like manner reduced to a pulp, and paper manufactured therefrom, or the quality of the paper may be varied by the admixture of a portion of rags or other filamentous substance.

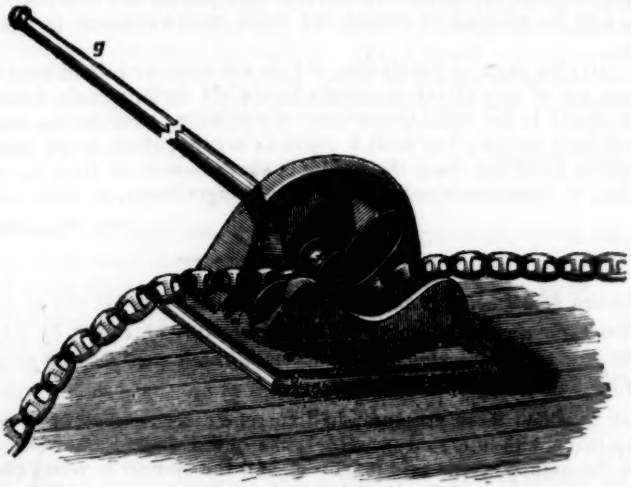
I would remark, that I am aware that some attempts have before been made to produce paper from the above mentioned material, but were abandoned from the incapability of producing good white paper.

What I claim is the mode or process herein described, for making white paper by the application of bleached pulp, produced from the stalks or leaves of Indian corn, which bleached material has not heretofore been so used.

Rep. Pat. Invent.

Baron De Bode's patent Cable Retarder and Stopper.

The cable stopper consists of an iron bed *a*, *a*, with upright side pieces, *b*, *c*, supporting two friction rollers, *d*, *d*; the side-piece, *c*, is higher and



stronger than *b*, and the short lever, *e*, carrying the friction roller, *f*, is connected to the handspike or lever *g*, by a strong axis or pivot, through the side piece, *c*. The action of the apparatus will be readily seen; the lever, *g*, being raised, the friction roller, *f*, will be above, and clear of the cable; as soon as it is desired to retard the chain, depress the lever, *g*, when the

cable will be clasped between the rollers, *f*, and *d*, *d*; and by further depressing the lever, *g*, so as to bring the roller, *f*, to a nearly centrical position, the chain will be stopped by being clutched between the roller, *f*, and a stud or elevation in the bottom of the stopper.

The following are among the advantages stated by the Baron to be consequent upon the use of his stopper:

Most of the stoppers have not the means of retarding the speed of a running cable which is known to be so pernicious to the men, and articles on deck, and those which can partially retard, can only do it at the destructive expense of both the cable and the stopper, as the cable has to rub through fixed bodies of metal; whereas, in the Baron's it slides between rollers.

The cable being stretched whilst running, when the speed is retarded by pressing the middle roller on it, there is no risk of destructive chafing, as it never gets in contact with the small elevation on the bottom of the stopper, until the middle roller is pressed down to the degree of stopping the cable altogether.

All stoppers hitherto in use stop the cable by pressing suddenly on one link only of the chain, whilst the roller of this one, presenting a larger surface, presses on three links; and instead of stopping the cable suddenly, can but stop it gradually, however quickly the operation may be performed. This must naturally prevent many ruptures, and even the frequent partial injuries to which cables are so subject.

This stopper will answer for a hemp cable as well as any chain of whatever size or figure it may be; whilst the other stoppers in use are still more destructive to hemp cables than to chains.

As the cable never has to force its way through two fixed metal bodies, there is no reason for either stopper or cables wearing out by the operation of stopping.

Most stoppers are by their angular opposition to the strain of the cable, and by their being fixed only to one of the ship's beams, more or less exposed to be broken or torn from their holdings, or even to injure the beam they are attached to, whilst this one, presenting a large basis may easily be fixed to three or more beams, by means of two cross beams underneath the deck; and as it works quite horizontally, it cannot be exposed to capsize, nor to be torn to pieces.

The construction being much simpler and more solid than all others, it is evident, that besides its not being so much exposed to the above aidents, it must in itself be less subject to repairs.

Lond. Mech. Magazine.

Progress of Practical and Theoretical Mechanics and Chemistry.

On the Manufacture of Glass by the Egyptians.

The authority of Pliny* has been called forth to prove that glass was a late discovery of some Phœnician mariners, who having lighted a fire on the sea-shore, and supported their cooking utensils on blocks of nitre, were taught by the union of the fused substances the secret of this useful invention. The Roman naturalist had fixed no time for this event, and if he

* Plin. xxxvi, c. 26.

spoke of improvements in the art, introduced in the reign of Tiberius, it was presumed that, though a vitrified substance was known, its qualities were not properly understood, and that its discovery only dated about the Augustan age. They even objected, that, under the first Emperors, windows were made of a transparent stone, brought from Spain and other countries, called *Lapis specularis;* and they hence inferred the imperfect knowledge of glass.

This stone is now well known under the name of mica; it was only used in the houses of the rich, in litters, or as an ornament to the best apartments, other persons being content with linen, horn, or paper.

Such were the feeble arguments brought forward to disprove the use of glass, for vases and for ornamental purposes, among the Romans; but with much less reason did they apply to its invention in other countries; and though the Egyptians never knew the necessity, or rather the annoyance, of glass windows, under a burning sun, they were well acquainted with vases of that material; and the workmen of Thebes and Memphis, and subsequently of Alexandria, were famed for the excellent qualities of glass-ware they produced, with which Rome continued to be supplied, long after Egypt became a province of the Empire. Strabo was informed by a glassmaker of Alexandria, that a peculiar earth was found in Egypt, without which it was impossible to manufacture certain kinds of glass of a brilliant and valuable quality; and some vases presented by an Egyptian priest to the Emperor Hadrian, were considered so curious and valuable, that they were only used on grand occasions.

Such, too, was the skill of the Egyptians in the manufacture of glass, and in the mode of staining it of various hues, that they counterfeited with success the amethyst and other precious stones, and even arrived at an excellence in the art which their successors have been unable to attain, and which our European workmen, in spite of their improvements in other branches of this manufacture, are still unable to imitate; for not only do the colours of some Egyptian opaque glass offer the most various devices on the exterior, distributed with the regularity of a studied design, but the same hue and the same device pass in right lines directly through the substance; so that, in whatever part it is broken, or wherever a section may chance to be made of it, the same appearance, the same colours, and the same device, present themselves, without being found even to deviate from the direction of a straight line, from the external surface to the interior.

This quality of glass, of which I have seen several specimens, has been already noticed by the learned Winkelmann, who is decidedly of opinion that "the ancients carried the art of glass making to a higher degree of perfection than ourselves, though it may appear a paradox to those who have not seen their works in this material." He described two pieces of glass, found at Rome a few years before he wrote, which were of the quality above mentioned. "One of them," he says, "though not quite an inch in length, and a third of an inch in breadth, exhibits on a dark and variegated ground, a bird resembling a duck in very bright and varied colours, rather in the manner of a chinese painting than a copy of nature. The outlines are bold and decided, the colours beautiful and pure, and the effect very pleasing, in consequence of the artist having alternately introduced an opaque and a transparent glass. The most delicate pencil of a miniature painter could not have traced with greater sharpness the circle of the eyeball, or the plumage of the neck and wings, at which part this specimen has

been broken. But the most surprising thing is, that the reverse exhibits the same bird, in which it is impossible to discover any difference in the smallest details; whence it may be concluded that the figure of the bird continues through its entire thickness. This picture has a granular appearance on both sides, and seems to have been formed of single pieces, like mosaic work, united with so much skill, that the most powerful magnifying glass is unable to discover their junction.

"From the condition of this fragment, it was at first difficult to form any idea of the process employed in its manufacture; and we should have remained entirely ignorant of it, had not the fracture shewn that filaments of the same colours, as on the surface of the glass, and throughout its whole diameter, passed from one side to the other, whence it has been concluded that the picture was composed of different cylinders of coloured glass, which being subjected to a proper degree of heat, united by (partial) fusion. I cannot suppose they would have taken so much trouble, and have been contented to make a picture only the sixth of an inch thick, while, by employing longer filaments, they might have produced one many inches in thickness, without occupying any additional time in the process; it is therefore probable this was cut from a larger or a thicker piece, and the number of pictures taken from the same, depended on the length of the filaments, and the consequent thickness of the original mass.

"The other specimen, also broken, and about the size of the preceding one, is made in the same manner. It exhibits ornaments of a green, yellow, and white colour, on a blue ground, which consist in volutes, strings of beads, and flowers, ending in pyramidical points. All the details are perfectly distinct and unconfused, and yet so very minute, that the keenest eye is unable to follow the delicate lines in which the volutes terminate; the ornaments, however, are all continued without interruption, through the entire thickness of the piece.

Sometimes, when the specimens were very thin, they applied and cemented them to a small slab of stone of their own size, which served as a support on the back, and by this means they were enabled to cut them thinner, and consequently to increase their number.

Wilkinson on the Manners and Customs of the Ancient Egyptians.

Ed. N. Philos. Journ.

On the Composition of a new Indelible Ink. By Dr. Traill.

In a paper lately read before the Royal Society of Edinburgh, Dr. Traill, after an account of many unsuccessful experiments to produce a durable ink from metallic combinations, stated that he was induced to attempt the composition of a carbonaceous liquid which should possess the qualities of good writing-ink. The inks used by the ancients were carbonaceous, and have admirably resisted the effects of time; but the author found that the specimens of writing on the Herculaneum and Egyptian *papyri* were effaced by washing with water; and on forming inks after the descriptions of Vitruvius, Dioscorides, and Pliny, he found that they did not flow freely from the pen, and did not resist water,—qualities essential to a good writing-ink in modern practice. The carbonaceous inks with resinous vehicles, rendered fluid by essential oils, though they resisted water and chemical agents, had the disadvantages of not flowing freely from the pen, and of spreading on the paper, so as to produce unseemly lines. Solutions of caoutchouc in coal-naphtha, and in a fragrant essential oil, lately imported from South America,

under the name of *aceite de sassafras* (the natural produce of a supposed Laurus), were subject to the same objections. The author tried various animal and vegetable fluids as vehicles of the carbon, without obtaining the desired result, until he found, in A SOLUTION OF THE GLUTEN OF WHEAT IN PYROLIGNEOUS ACID, a fluid capable of readily uniting with carbon into an ink, possessing the qualities of a good, durable, writing ink. To prepare this ink, he directs gluten of wheat to be separated from the starch as completely as possible, by the usual process, and when recent to be dissolved in pyroligneous acid with the aid of heat. This forms a saponaceous fluid, which is to be tempered with water until the acid has the usual strength of vinegar. He grinds each ounce of this fluid with from eight to ten grains of the best lamp-black, and one and a half grain of indigo. The following are the qualities of this ink. 1. It is formed of cheap materials. 2. It is easily made, the colouring matter readily incorporating with the vehicle. 3. Its colour is good. 4. It flows freely from the pen. 5. It dries quickly. 6. When dry it is not removable by friction. 7. It is not affected by soaking in water. 8. Slips of paper written on by this ink have remained immersed in solutions of chemical agents, capable of immediately effacing or impairing common ink, for seventy-two hours, without change, unless the solutions be so concentrated as to injure the texture of the paper. The author offers this composition as a writing-ink, to be used on paper, for the drawing out of bills, deeds, wills, or wherever it is important to prevent the alteration of sums or signatures, as well as for handing down to posterity public records, in a less perishable material than common ink. He concluded his paper by stating, that should it be found to present an obstacle to the commission of crime—should it, even in a single instance, prevent the perpetration of an offence so injurious to society as the falsification of a public or a private document, the author will rejoice in the publication of his discovery, and consider that his labour has not been in vain.

Edin. New Phil. Journ.

ARTICLES FROM THE FRENCH JOURNALS. TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE, BY J. GRISCOM.

Note relative to the Clarification of the water of the Nile,—and of water, in general, which holds earthy substances in suspension; by FELIX D'ARCET.

Travellers in Egypt have described, with more or less precision, the means generally employed to clarify the waters of the Nile, but they have not attempted to perfect this process, and have not pointed out the mode of operation. My sojourn in Egypt enabled me to study the process carefully, and the object of the following note is to furnish an account of it.

The waters of the Nile are turbid throughout the year, and during the inundation they contain eight grammes per litre, of earthy matters in suspension.

It is always clarified, but more for the purpose of avoiding the disagreeable taste of muddy water, than for objects of health; for many of the inhabitants of the villages of upper Egypt, drink the water as they draw it from the Nile, without being incommoded by it.

Two methods are practised in Egypt, for clearing the water of the

Nile from its slime. The first, employed only by the rich, because it is attended with considerable expense, consists in filtering the water, through porous vessels; the second, which may be practised by all, is effected by means of almonds.

The wealthy have in their houses large jars of porous clay, made at Kenne, a village of upper Egypt. They are placed on a wooden tripod in the most airy part of the house, and are kept constantly full of the water as drawn from the rivers, and the clarified water, which proceeds from them is received in tureens. By choosing the most airy place for the filtering jars, the temperature is somewhat reduced by evaporation, but the difference is scarcely sensible.

Many persons pay no attention to it, and the apparatus is often put into a portable closet to guard the filtered water from dust and insects which might spoil it. Each of the jars alluded to, costs at the factory, 1 franc 10 cent, but at Cairo they cost 3 francs 60 cent: they vary in capacity from 80 to 90 litres or quarts. They must be changed every year.

Every fifteen or twenty days the jars require to be cleaned from the impurities which collect upon them. It is evident that if the filtration was performed by ascension, they would remain clean much longer, but in a country where all the arts are in their infancy,* and where workmen could not be found capable of constructing or repairing the complicated apparatus used in France for clarifying water, for domestic purposes as well as for large manufactories, simple processes can alone be adopted.

The process of clarification first described, is altogether mechanical; —the other is due to a cause more complicated.

After having filled, with the troubled water, a jar much less permeable than those above mentioned, a loaf of almond flour, made for this purpose, is taken in one hand, and with the arm plunged in the water, the loaf is rubbed against the rough sides of the jar, until it is worn down to a mark previously made by the nail. The water is then stirred about effectually by the arm, then covered up and left at rest 4 or 5 hours, at the end of which time the water is clarified. It is the *Sacca*, or water bearer, who performs this office after bringing from the river the quantity necessary for the use of the house.

In rubbing the sides of the jar with the almond loaf, the *Saccas* hear a sharp hissing sound which they deem indispensable to the clarification. Another observation they make, better founded than the last, is that the water will not be clarified if it is agitated during the subsidence of the deposite or if the sediment be stirred up. This is analogous to what is observed in the clearing of wine, when entire repose does not succeed to the mixing of the troubled wine with the isinglass or albumine.

Almonds do not possess, alone, the property of clarifying;—for at Sennaar, at Dongolah, and in Nubia, beans are used and not unfrequently even the castor bean. Whatever the substance employed, the water, seldom acquires by this means, great limpidity, and how long soever the action may be continued, its limpidity remains with every pre-

*How curiously does this contrast with the expression, often used, that Egypt was the *cradle* of the *arts*, and with the undoubted fact that in this very country, almost all the utensils now known, were employed in the earliest recorded periods of civilization. How striking the revolutions which time produces in the condition of nations. Trans.

caution, more or less imperfect. The process of filtration, aside from considerations of economy, is therefore much to be preferred.

We find at Cairo and in all the bazaars of Egypt, the little almond loaves, I have been speaking of. They are made by pounding in a mortar, either sweet or bitter almonds, and afterwards working up the paste into the form and size of an egg.

These almond loaves are sold at 5 parats, or about 4 centimes each. They weigh at a medium 63.70 grains and may serve for a month. The jars used for this purpose are made in the neighbourhood of Cairo, of coarse clay and cost only 70 centimes.

In the last described process, the almonds in this state of minute division, produce a sort of emulsion, the oil unites to the earthy particles, and precipitates, thus facilitating their separation from the water. In this case the almonds act, if we may so speak, in an inverse manner to that of flax-seed cake in the clarification of oil. We know, that after having mixed sulphuric acid with oil to depurate it, a great quantity of parenchyma is carbonized by the action of the acid, and remains in suspension in the liquid, and that when the pulverised cake is stirred in and left at rest, the fecula of the cake, which contains water, unites with the carbonized parenchyma, separates it from the oil, carries it to the bottom and thus perfects the clarification of the liquid. Might we not conclude, incidentally, that flax-seed cake would serve to clarify turbid water?

Perceiving the imperfection of the process adopted in Egypt, for clearing the waters of the Nile, by means of almonds, I attempted to employ alum which has long been indicated, and which my father had successfully used in clarifying the water of the Seine. My results were very satisfactory.

With half a gramme (about 8 grs. troy) of alum to a quart of water, I produced in an hour's time, complete clarification, and the water became extremely limpid. Half the quantity of alum produced the same effect but it required a little more time. The alum produces no unpleasant effect upon the health, for 4 grains or even 8 grains, to a quart are quantities so small that this effect is a perfect nullity. Besides, in this mode of clarification, the alum acts only by undergoing decomposition; the excess of acid it contains is saturated by the carbonate or bicarbonate of lime in the water, and it is only in passing to the state of an insoluble subsulphate, which is precipitated, carrying with it mechanically the earthy particles, that it produces the desired limpidity in the water.

It is preferable, in this process, to employ the alum in large pieces. The best way is to fasten a large crystal of alum to the end of a thread and move it in all directions through the water just below the surface, and taking it out as soon as large flocculi appear. The formation of a sediment is a certain sign that the requisite dose of alum has been dissolved.

If it be desired to use powdered alum, in order to be more certain of the right quantity, it must be reduced to a fine powder, weighed, and then sprinkled on the surface of the water, avoiding any considerable agitation after the salt has been added.

We may also dissolve, in a small quantity of clear water, the quantity of alum we wish to employ, and to pour this solution on the turbid

water, stirring the surface slightly after the addition, and letting it rest. It becomes speedily clarified, and very limpid.

The sediment which alum gives, increases in weight much beyond the limits which the salt would proportionately afford. The quantity before mentioned might therefore be increased without inconvenience. The experiments made in Egypt, were with alum with a base of potash but I think that alum with a base of ammonia would yield similar results.

I recommended, as far as practicable, this mode of clarification, which always succeeded perfectly, during my stay at Cairo, and I hope that in a few years it will be generally followed. They had begun to prepare at the time of my departure, little packets of alum for this purpose.*

Ann. des Ponts et Chaussees.

Note on the Steam Engine of Savery, by COLLADEN *and* CHAMPIONNIERE.

We are in possession of but a small number of exact data relative to the effect of machines, and especially on *motive powers*. Chosen some years ago to give a course on mechanics, at the Central School of Arts and Manufactures, I was obliged often to have recourse to experiments, to ascertain the useful effects of *steam movers*, (moteurs á feu.) The note which I present to the Academy, is a summary of the expeiments I made with M. Championniere, civil engineer, with the steam engine on *Savery's construction*.

In these very simple machines, the steam raises the water by its immediate action. The steam is introduced into a vessel, then condensed, and produces a respiration or flowing in of water.

A second admission of the steam drives the water up into the reservoir.

These machines were the first steam movers employed in large works. They were afterwards abandoned for the machines of Newcomen and Watt.

Several manufacturers, especially Manoury D'Hectol, nevertheless have employed them.

As our experiments may serve to fix the value of these engines, and the conditions under which the employment of them may be preferable, we think it may be useful to publish them.

We possess very few estimates of the power of the Savery machine:—Bradley, Smeaton, Manoury and Girard, have published some memoirs on its effects; but we find in no publication on the subject, the measure of increase of heat in the water elevated, nor of any other element needful to the theory of these motive powers.

But a very small number of the Savery machines are in existence. We know of but *five in operation, three are in the department of the Seine, the fourth in Loire Inferieure, and a fifth at Lyons.* We believe there are none remaining in England.

We have experimented with the three of the department of the Seine. The oldest is at the *abattoir de Grenelle*, and was constructed by Manoury. The two others are in the Vigier baths; they were made by Gingembre.

* Compare this recommendation of alum with the objections made to its use in the paper of Arago on filtration, published in the last number of this Journal.

The following numbers were obtained from these three machines in three series of experiments.

Experiment of the 26th March 1833, on the bath machine of Pont Marie.

Temperature of the water of the Seine,	$6\frac{1}{4}°$
Mean tension of the steam,	3atm.
Water raised per hour,	12.213m.
Height of elevation,	6.6m.
Temperature of the water raised,	$10\frac{1}{4}°$
Dry wood burned during one hour,	30.4k.
Duration of a period,	26.0″

Experiment of the 10th July 1833, with the same machine.

Temperature of the water of the Seine,	$19\frac{1}{4}°$
Mean tension of the vapour,	3atm.
Water raised per hour,	12.724m.
Height of elevation,	6.10m.
Temperature of the water raised,	$23\frac{1}{4}°$
Dry wood burned in an hour,	46kil.
Duration of a period,	26″

Experiment with the machine of Manoury D'Hectol.

Temperature of the water of the well,	$12\frac{1}{2}°$
Mean tension of the steam,	00
Water raised per hour,	15.400m.
Height of elevation,	14m.
Temperature of water raised,	$16\frac{1}{4}°$
Charcoal burned in an hour,	13kil.
Duration of a period,	90″

Agreeably to the first and second tables, the machine of Pont Marie gives 2.595 dynam, to a kilogramme of wood.

This is about eight times less than the effective force of a small piston machine of the same force which would work pumps. But the water raised would have to be afterwards heated, so that we must take into account the increase of temperature, which was four degrees Cent. ($= 7\frac{1}{2}$ F.) in the first series, in the month of March, and three quarters in the second in July. Thus, in the first case, each kilogramme of wood sent up to the reservoir, by the action of the machine 1702, portions of heat (caloric) and in the second 1255. With a more complicated machine than that of Savery, an additional heating apparatus would have been necessary, and this addition would have required the same expense.

Thus, whenever water is to be both raised and heated (and this often occurs in manufactories) the almost forgotten machine of Savery is the most advantageous motive power. It is the least costly at first, the least subject to accidents, and to wear and tear, and the most easily managed.

We will add a few words on the comparative effect of the three machines. In all of them the accession of heat was about four degrees, although the Manoury machine differs essentially from the two others.

The last machine performs more than double the work of those of Gingembre, at the same cost. Agreeably to the public report of M. Girard, in the 21st Vol. of *Annales de Physique et de Chimie*, the Manoury

machine gave 20.202 dynam for each kilogramme of charcoal. This result surpasses that obtained by us, whence the increase of temperature of the water must at that time have been at a maximum of 2.8° instead of 4°. This measure is wanting in the memoir referred to.

From the foregoing experiments it results:

1. That the Savery machine is a very valuable motive power which may be advantageously employed in many of the arts.
2. That the use of it ought to be limited to those cases in which water is to be heated as well as elevated.
3. That the machine of Manoury is the best model for imitation.

Ann. des Pontes et Chaussees.

Blasting of Rocks.

Means of kindling a blast, without danger, at the bottom of a well or shaft, without risk of failure.

Very brief notices may sometimes render great service, and when they have the stamp of utility upon them the Ann, des Ponts et Chaussées, will register them with pleasure.

The following will strike every reader by its simplicity; but it may, nevertheless, prevent some fatal imprudencies and save the lives of miners.

We allude to the difficulty of blasting a rock at the botton of a well, or other excavation, where there is no place for the miner to retreat to for safety.

When the priming is furnished with a piece of touch-wood, it is often fired by throwing down burning paper or other ignited bodies; but when the explosion does not take place, after a considerable time has elapsed, it has happened that on going to examine the charge, it has exploded, and death or dreadful wounds have been the consequence. The means, therefore, of safely igniting the match must be a matter of interest. For this purpose M. Devilliers' proposes the following simple method.

The miner, before ascending, fastens a wire to the touch-wood which communicates with the priming, and extends this wire, as he ascends, to the surface; being careful to prevent any knots from remaining in it.

A bunch of touch-wood, pierced with a hole through its centre, is fired and allowed to slide down the wire, giving the operator full time to retreat to a place of safety, while the kindling of the match at the bottom can hardly fail to take effect.

Ibid.

In all ordinary cases, the safety fuse described at page 63 of our last volume, might be deemed preferable to the mode above suggested. We know not whether it (the safety fuse) has been introduced, and used in the United States, or not;—but in point of cheapness the wire guide now proposed, might be preferable, and perhaps it would be as certain in its effect. G.

Report to the Societé d'encouragement, on two prizes,—one for perfecting the fabrication of dextrine, and its application to the useful arts;—the other for the extraction of sugar from dextrine; by **M. Payen.**

The numerous and useful applications of dextrine obtained by the various means by which starch is disintegrated, make it extremely desirable that this new commercial product should be obtained as free as possible from colouring matter, and of a uniform quality, so that it may, with all its advantages, be used as a substitute for the gums in the preparations of various tissues, both white and of transparent shades,—for coatings and colourings of paper hangings,—for giving a lustre to prints and coloured lithographs,—for extending sheets in drawings,—and other applications pointed out by the Baron de Silvestre.

The society will adjudge a premium of 2000 francs, to the best solution of this question, provided, the author shall manufacture it in such a quantity as to throw into the market at least 600 kilogrammes, per day, of a good and even quality.

The competitors must furnish a complete account of the various uses of dextrine* and indicate the factories or places where the committee may witness its successful applications.

Various laboratory trials and applications in the large ways, have demonstrated that it is possible to convert, by means of diastase, starch into sugar, whiter, purer, and of a better taste than that which is produced by the saccharification of starch by sulphuric acid. The latter indeed, has a styptic taste, and a disagreeable odour, and contains besides, a notable portion of calcareous salt which is injurious in some of its applications. There are other inducements for avoiding the use of a powerful acid in manufactures destined to spread through the country.

The sirops and sugars of dextrine, obtained from germinated grain, are commonly exempt from these defects; but their preparation demands more skill, especially in developing, by means of germination, the greatest quantity of the active principle, and avoiding any injurious change in it. There is some difficulty also, to be overcome, in thoroughly clarifying and filtering sirops, and in evaporating them so as to avoid the production of colour.

The Societè d'encouragement, desirous of rendering the conversion of starch into sugar, an easily attainable object without the intervention of sulphuric acid, offers a premium of 3000 francs, to any one who shall completely succeed in this enterprise, and establish a safe and easy process which may be followed without risk of failure.

The sugar thus prepared must be white, solid or grained, of a free, sweet taste, immediately applicable to the making or improvement of the different kinds of beer, cider and wine,—to confectionaries, preserving fruits, and grapes, to eduleorating drinks, and be decidedly preferable in this respect to solutions of liquorice.

*Starch, in its several varieties, consists, (when examined by the microscope,) of small brilliant spherules, each of which has a coating less soluble than its interior. Heat bursts these envelopes and lets out their contents, which consist of a gum-like substance, to which the name of *Dextrine* was given by Biot. It is much the same as the *Amidine* of Saussure, and of the chemical books. Trans.

It is not required that this product should be a substitute for cane or beet sugar, as the peculiar nature of grape or starch sugar would hardly admit of it.

A manufactory of 300 kilogrammes a day, must be in operation so that the society may witness the process and prove the good quality of the article produced.

The Society holds itself ready to offer premium medals to any one who makes the nearest approach to the object in view, either in preparing sugar or sirop—or in their application.

Bull. d'encour, Decem.

Compensation Pendulums; by M. Wiesniewsky.

It is well known that the system of compensation by mercury, contrived by Graham, consists of a glass vessel filled with mercury, which fastened to a strong rod, performs at once the office of a bob or lens, and of a compensator. But this compensation is very imperfect, inasmuch as it is not affected by the sudden changes which take place in the ambiant atmosphere, and which are often very considerable. To perfect it, M. Wiesniewsky proposes to render the temperature uniform, throughout the pendulum, by distributing the mercury through a number of small hollow iron cylinders, disposed symmetrically on each side of the rod. By greatly increasing the surface of the mercury in proportion to its volume a much more rapid change of temperature will take place in the metal, the rate of which will be expressed by a formula based on experiment, made for the purpose. The equation of the curve of the generating surface of the exterior surface of the iron rod, may then be obtained, a curve which will satisfy the conditions of the problem, viz: that the progress of temperature throughout the whole length of the rod may be always conformable to that which takes place in the mercury. Ibid.

New process for cleaning cloth from grease; by M. Martin.

This process, which is very easy, consists in washing the cloth in warm water to deprive it of paste or gum, then to impregnate it with a mixture of Fuller's earth, potash or other alkaline material, and, thus prepared, to suspend it in a tight box or receiver and subject it to the action of a jet of steam. When withdrawn, it is thrown into the water and passed between two cylinders to clean it.

The cloth, in this process, receives no fulling, and by means of a small boiler, which costs but little, a large amount of work can be rapidly performed. Ibid.

Progress of Physical Science.

Simultaneous Meteorology.—No. V.

TABLE OF HOURLY METEOROLOGICAL OBSERVATIONS, made during the 21st and 22nd Dec., 1837, at BLACKHEATH ROAD, near Greenwich, about four miles and a half S. E. of London, *by and under the superintendence* of J. H. BELVILLE, in conformity with the Instructions circulated by the South African Literary and Philosophical Institution.

DATE.	HOUR.	Barometer.	THRM. Attach'd	THRM. In open air.	WIND. Direction.	WIND. Strgth.	Prop. of Cloud.	STATE OF THE ATMOSPHERE, CLOUDS, &c.
		Eng. In.	F. °	Fah. °				
Thursday, December 21, 1837.	VI. A.M.	29.760	53	42.4	N.	3	10	Stormy high wind; densely cloudy.
	VII.	29.840	53	42.0	N.	3	10	Ditto. ditto.
	VIII.	29.895	53	42.0	N.	2	10	Clouds broken; more moderate.
	IX.	29.958	52	41.1	N.	2	7	Getting clearer. *Sunshine at intervals.*
	X.	30.020	52	41.2	E.b E.	2	5	Passing drops of rain since last obs.
	XI.	30.080	52	41.2	N.N.E.	2	6	Much driving cloud *scud* from N.N.E.
	XII.	30.110	51½	41.2	N.N.E.	1	6	Wind going down. Air getting dry.
	I. P.M.	30.120	52	42.5	N.N E.	1	5	Little or no variation.
	II.	30.136	51	41.5	N.NE.	1	10	The same.
	III.	30.153	51	41.4	N.N.E.	1	10	Getting now more overcast, and no wind.
	IV.	30.200	51	41.0	N.E.	1	10	The maximum by a self-registering thermometer 43°,1.
	V.	30.225	50	40.5	N.E.	1	10	
	VI.	30.294	51	40.8	N.by.	1	10	N. B. Barometer very unsteady for two or three hours.
	VII.	30.250	52	40.2	E. b S.	1	10	
	VIII.	30.239	51½	39.4	E.S.E.	0	10	
	IX.	30.251	51	40.1	S.	0	10	A completely covered sky, and no variation in its appearance for these 15 hours.
	X.	30.292	51	39.2	S.	0	10	
	XI.	30.268	51	39.1	S.	0	10	
	XII.	30.254	51	39.0	S.	0	10	
Friday, December 22.	I. A.M.	30.250	51	39.0	S.	0	10	
	II.	30.241	51	39.0	S.S.W.	1	10	
	III.	30.208	51	39.1	S.S W.	1	10	
	IV.	30.182	51	39.5	S.S.W.	1	10	
	V.	30.157	51	40.0	S.W.	1	10	The min. by a self-registering therm. 38°.2.
	VI.	30.150	51	40.6	S.W.	1	10	
	VII.	30.132	51	41.0	S.W.	2	10	Clouds a little broken. The lowest of a radiator on the ground, 37°.
	VIII.	30.114	51	42.6	S.W.	2	10	Quite thick.
	IX.	30.100	51	42.9	S.W.	2	10	The same.
	X.	30.090	49	44.1	S.W.	2	10	The same; *scud* swiftly moving from S.W.
	XI.	30.080	50	45.5	S.W.	2	10	The same.
	XII.	30.062	50	46.0	S.W.	2	10	The same; drizzling rain.
	I. P.M.	30.030	51	47.0	S.W.	2	10	The same.
	II.	30.011	51	48.6	S.W.	2	10	The same.
	III.	30.000	51	48.0	S.W.	2	10	The same; sky gets turbid and gloomy.
	IV.	29.981	51½	48.0	S.W.	2	10	The same.
	V.	29.974	52	49.1	S.W.	2	10	The same.
	VI.	29.958	52	49.5	S.W.	2	10	The same.

NOTES.—A violent gale night of the 20th and morning of the 21st, from W N.W. and N. At 1 A. M, the barometer at 29.32, and as the wind got to the N.W. and

Extract of a letter from Sir John Herschel, to the President of the Royal Astronomical Society, giving an account of a remarkable increase of magnitude of the star η in the constellation ARGO, *observed by him at the Cape, December 16th, 17th, 1837.*

"I have just observed a very remarkable phenomenon, the development of which I am watching with much interest. It respects the nebulous star η in the constellation *Argo*, No. 1281 of the Catalogue of the Astronomical Society, marked in that catalogue as of the second magnitude. As such, or rather as intermediate between the first and second, as a very large star of the second magnitude, or a very small one of the first, I have always hitherto observed it, having in some cases equalized it with *Fomalhaut*; in others placed it intermediate between α and β *Crucis*, nearly equal with the latter, &c.; nor have I at any time had reason to suppose its magnitude variable. To night, however, being at work on my classification of the southern stars in the order of their magnitudes, I was much astonished to find its magnitude superior, not only to that of *Fomalhaut* and α *Crucis* (with which stars it no longer admits of a moment's comparison,) but even to that of *Aldebaran*, *Procyon*, α *Eridani*, α *Orionis*, and little if at all inferior to that of *Rigel*.

"This was my own judgment, and that of several persons whom I called to my assistance, in the early part of the night, when η was low and *Rigel* high in the heavens. At the time I write, they have about equal altitudes, and the comparison is decidedly in favour of η, which is in fact (*Sirius* and *Canopus* excepted,) the most brilliant star now visible; α *Centauri* being too low for fair comparison, and veiled with some degree of haze.

"This remarkable increase of magnitude has come on very suddenly, as my attention has frequently of late been drawn to this star in the lower part of its diurnal circle, while watching with some impatience its progress towards the meridian, at a reasonable hour of the night, that I might resume and complete, before my departure hence, a very elaborate monograph of the wonderful nebula which surrounds it. A few evenings before the full moon just passed, in particular, I remember to

N., it rose at the rate of above 1-10th of an inch in an hour; the thermometer, at noon on the 20th, rose to 55°, a degree of warmth very uncommon on the day preceding the winter solstice.

A remarkably cloudy period; not a star visible during the whole night. The atmosphere was covered with one mass of dense cloud; the sun, likewise, was not once seen on the 22nd.

The time was taken from a good clock, keeping mean time. Rate scarcely perceptible. Error obtained by observation of the ball-drop of the Royal Observatory, Greenwich.

The Barometer has an elevation of 46 feet above *mean high water mark* of the river Thames, carefully deduced by very accurate barometrical measurement. The index error of scale presumed to be within a *hundreth* or two of the truth. The Thermometer, by Dollond, suspended in open air, at an elevation of 40 feet from the ground: aspect, northerly.

The comparative strength of wind is indicated by the figures thus,—0 means no wind perceptible; 1, very light breeze; 2, strong; 3, a gale. In the column headed *Proportion of cloud*, 0, signifies quite clear; 10 no blue sky visible; 5 sky half covered.

have noticed it with this view; and had it then been what it now is, a star of the first class, it could not have passed unremarked.

"Whether it be now at its maximum, and about to decrease by insensible degrees; whether, like *Algol*, but in a much longer time, it remains as it were dormant through the greater part of its period, and runs through its phases of increase and decrease in a small aliquot portion of the whole; or whether, lastly, it be on the point of blazing forth with extraordinary splendour, so as possibly to outshine its brilliant neighbours, *Centauri* and *Canopus*, it is useless to conjecture, and observation will soon determine."

The President read an extract of a letter from Mr. Henderson relative to the remarkable increase of magnitude, in *Argus*, recently noticed by Sir John Herschel, as mentioned at the last meeting of the Society. Mr. Henderson states that the star is not to be found at all in Ptolemy's catalogue, although the bright stars of the Cross and the Centaur, which culminated as low at Alexandria, are inserted in it. From this circumstance he infers that, at this remote period, the star was not very bright. It is not in Bayer's maps; and in Halley's catalogue it is said to be of the *fourth* magnitude, which is less than some of the neighbouring stars that in modern times cannot compete with it. It would thus appear that the star has for a long period been increasing in brightness; and it will be remarkable if it should surpass the brightest at present known.

Lond. and Edin. Philos. Mag.

Proceedings of the American Philosophical Society.

February 16, 1838—Dr. Patterson, V. P. in the Chair.

Electricity.—Professor Henry, of Princeton, made a verbal communication on the lateral discharge of Electricity while passing along a wire, as in the Leyden experiment, or communicated directly to an isulated wire, or to a wire connected with the earth; and detailed various experiments, proving that free electricity is not, under any circumstances, conducted silently to the earth.

March 2.—Mr. Du Ponceau, President, in the Chair.

Longitude.—Mr. Walker read a paper, entitled "Determination of the Longitude of several Stations near the Southern Boundary of Michigan; calculated from Transits of the Moon and of moon culminating Stars, observed in 1835 by Andrew Talcott, late Captain of United States Engineers."

The longitude of places in the United States, north of the Ohio, had hitherto depended on the observations of Ellicott and De Ferrer, made at points on the banks of the Ohio river, and on meridian lines drawn from this river, several hundred miles northward, by the deputy surveyors. From Mr. Walker's computations, it appears that *Turtle Island, Lake Erie*, has been placed only 1.7 geographical miles too far east on Tanner's Map. Its true place is 41° 45′ 9″ N. latitude; and 5 hours, 33 min. 34.3 sec: W. longitude from Greenwich. Also, *South Bend Lake, Michigan*, has been placed 3.9 miles too far east; its true place being N. 41° 37′ 6″; W. 5 hours, 49 min. 15.3 sec. These observations of Capt. Talcott will prove highly useful to geographers, by furnishing standard points of reference in the northernmost parts of the United States.

May 4.—Dr. Patterson, V. P., in the Chair.

Electricity.—Dr. Patterson read a letter from Professor Henry, of Princeton, dated May 4, 1838, announcing that, in recent experiments, he has produced directly from ordinary electricity, currents by induction analogous to those obtained from galvanism; and that he has ascertained that these currents possess some peculiar properties, that they may be increased in intensity to an indefinite degree, so that if a discharge from a Leyden jar be sent through a good conductor, a shock may be obtained from a contiguous but perfectly insulated conductor, more intense than one directly from the jar. Professor Henry remarks that he has also found that all conducting substances screen the inductive action, and that he has succeeded in referring this screening process to currents induced for a moment in the interposed body.

Fused Platinum.—Dr. Hare exhibited to the Society fourteen and a half ounces of platinum, fused by his hydro-oxygen blowpipe, and a specimen of pure platinum, freed from iridium by the process of Berzelius.

Steam Navigation.—Dr. Patterson submitted to the Society's inspection the log-book of the steam-ship Savannah, Capt. Moses Rogers, launched at New York on the 22d August, 1818; from which it appears that, after repeated voyages between New York, Savannah, and Charleston, this vessel left Savannah on the 24th or 25th of May, 1819, for Liverpool, saw Land's End on the 17th of June, and arrived at Liverpool, on the 20th of June, having used steam thirteen days, and having exhausted her fuel (coal) three days before arrival. It also appears from the log-book that she left Liverpool on the 23d of July, arrived at Elsineur on the 9th of August, left Elsineur on the 14th of August, arrived at Stockholm on the 22d of August, left Stockholm on the 5th of September, arrived at Cronstadt on the 9th of September, and after several excursions between Cronstadt, &c., and Copenhagen, &c., left Arundel, Copenhagen, on the 23d of October, and arrived at Savannah on the 30th of November; that she subsequently arrived at Washington from Savannah on the 16th of December, after a passage of eleven days; that she was sold at Washington in September, 1820, and her engine taken out, after which she sailed as a packet, from New York to Savannah, until September, 1822, when she was lost. This log-book was supposed to derive additional interest from the recent arrival of the Sirius and Great Western, steam-ships, at New York, from England.

Solidifying Carbonic Acid.—Dr. Mitchell repeated before the Society Thilorier's process for solidifying carbonic acid, with an apparatus, made under his direction in Philadelphia, somewhat modified from that employed by Thilorier, and froze a quarter of a pound of mercury by the admixture of the solidified acid with nitrous ether.

May 18.—Mr. Du Ponceau, President, in the Chair.

Elements of Water.—Dr. Hare communicated orally, that he has found that when the elements of water are exploded in contact with certain gases or essential oils, the aqueous elements, instead of condensing, combine with the hydrogen and carbon, and form a permanent gas.

July 20.—Mr. Du Ponceau, President, in the Chair.

Magnetic Dip in Ohio.—The Committee, appointed on the Communication of Dr. John Locke, of Cincinnati, read at the last meeting, made the following Report, which was adopted.

"The Committee to whom was referred the Communication of Professor John Locke, of Cincinnati, report that it gives the details of a series of experiments, made for the purpose of determining the magnetic intensity and dip for certain positions in Ohio. For these experiments he had furnished himself, in London, with the best apparatus, and had vibrated there two needles of the form recommended by Hansteen, and one in the form of a small flat bar. Five months afterwards, namely on the 17th of January, 1838, he again vibrated these needles at Cincinnati, and found the ratio of horizontal intensity at the former place to that at the latter, as follows: by needle No. 1, as 1 to 1.1624; by needle No. 2, as 1 to 1.1639; by No. 3, as 1 to 1.2037. Of these results, the author prefers the last; inasmuch as the magnetism of needles is liable to decrease, but not to increase.

"On the 20th of August, 1837, he made experiments with his dipping needle, to determine the dip at Westbourn Green, near London, the mean of which gives 69° 23′.3.

"On the 26th of Nov. 1837, the mean of a series of experiments made at Cincinnati, in lat. 39° 6′ N., and long. 84° 27′ W., gave the dip = 70° 45′.75.

"At Dayton, Ohio, in lat. 39° 44′ N., and long. 84° 11′ W., the dip was found to be 71° 22′.75 on the 26th of March, 1838.

"At Springfield, Ohio, in lat. 39° 53′ N., and long. 83° 46′ W., the dip was found, on the 29th of March, 1838, to be 71° 27′375.

"At Urbana, lat. 40° 03′ N., long. 83° 44′ W. March 30, 1838, the dip was found = 71° 29.′94.

"At Columbus, the seat of government of Ohio, lat. 39° 57′ N., long. 83° W., April 3d, 1838, the dip was found = 71° 04′.875.

"The interest of this paper is much increased by the circumstance that no accurate experiments on the intensity and dip of the needle have heretofore been made in the United States, west of the Alleghany mountains."

Dipping Needle for finding Longitude.—Dr. Patterson laid before the Society, copies of a Memorial presented to Congress by Dr. Henry Hall Sherwood, and of a Report thereon by the Committee on Naval Affairs of the Senate, in which are set forth Dr. Sherwood's "claims to have made new and important discoveries in magnetism generally, and more particularly in the magnetism of the earth; and to be the inventor of an instrument called the geometer, whereby, without the aid of the quadrant or sextant, or chronometer, and without taking a celestial observation, it is practicable and easy, at sea and on land, and in all weathers, to determine, merely by the dip of the needle, the variation of the needle, and the latitude and longitude of any place on the surface of the globe."

Dr. Patterson called the attention of the Society to some further extracts from the Report of the Naval Committee, in which it is stated that from the opinions obtained from scientific men, "as well as from their own examination, they are fully persuaded that the discoveries and invention of Dr. Sherwood are entitled to the most serious consideration of the public, and to the encouragement and patronage of Congress;" that they "regard them as highly interesting and important to the navigation and commerce of the United States, and as bidding fair to open a new era in the history of the science of magnetism." Of this Report 5000 additional copies were ordered to be printed by Congress.

Dr. Patterson remarked that the imposing circumstances under which

Dr. Sherwood's extraordinary claims were brought forward, might make a brief review of them worthy of the Society's attention.

1. The first of Dr. Sherwood's asserted discoveries is the communication of magnetism to a steel plate or ring, which he supposes others had failed to do. Dr. Patterson observed that, on the contrary, nothing is better known in experimental science than that magnetic polarity can be given to steel in any form, and with as many poles as the operator pleases. In illustration of this remark, he exhibited to the Society a steel plate, prepared some years ago by Mr. Saxton, who was then in London, according to an experiment first made by Chladni, on which polar lines were traced, so as to mark on one side the word '*magnet*,' and on the other the date '*24th of February*, 1836;' the position of the lines being made apparent by strewing steel filings over the plate.

2. Dr. Sherwood asserts that, if a steel ring, marked in two opposite points, have magnetism communicated to it by passing it over a magnet from one of those points to the other, in a way which he describes, the magnetic poles will be found to reside, not in the marked points which he styles the poles of the ring, but in other points distant from them 23° 28′, thus exhibiting a correspondence with the obliquity of the ecliptic. On this fact he founds his theory of the magnetism of the earth. Dr. Patterson mentioned that Mr. Saxton and himself had carefully repeated this experiment, and had found, without surprise, that the assertion of Dr. Sherwood was entirely erroneous. When the magnetism was communicated in the awkward manner used by Dr. Sherwood, the poles were not indeed at the points of the first and last contact of the magnet; but the deviation was irregular, was different at the different poles, and bore no relation to the obliquity of the ecliptic. When the magnetism was communicated to the ring by carefully setting two opposite points on the poles of a horse-shoe magnet, the *magnetic* poles of the ring coincided exactly with those points. This fact was shown in an experiment made before the society.

3. As to the hypothetical deductions of Dr. Sherwood, "that the magnetic poles of the earth are 23° 28′ from its poles, and of course within the polar circles," "that the magnetic and polar axes cross each other at the same angle of 23° 28′," "that the magnetic and terrestrial meridians of every place cross each other at angles dependent on the angles of the two axes," and "that the line of no variation is a great circle of the earth, and is that magnetic meridian, which, after cutting the magnetic pole, passes at the distance of 6° 28′ from the pole of the earth,"—Dr. Patterson remarked that these notions were directly contradicted by well-observed facts, that there are more than two magnetic poles, that the magnetic poles are not in the polar circles, that there are several lines of no variation, and that those lines are not great circles, but are altogether irregular in their course.

4. The practical applications of Dr. Sherwood's theory are announced in these terms: "With the correct dip given him, observed at a given time, he works out all or either of the following results: the variation of the needle, the distance of the circle of no variation from the place, and its angle with the meridian, and the latitude and the longitude. With the variation given him, in the same manner, he determines the dip and the other results. He must know, however, if the dip be given, whether the place of observation is east or west of the circle of no variation, and if the variation be given, whether it is north or south of the magnetic equator, and near the arctic or antartic semi-circle of no variation."

It is sufficient to remark, said Dr. Patterson, on this train of assertions, that they necessarily assume the truth, within the limits which are stated, of two positions: 1st. that the same dip will always correspond with the same variation, and 2d, that every place on the earth's surface has a different dip from all others,—both of which are notoriously untrue. The various examples, contained in the Report, of calculations made from the single datum of the dip or the variation, and which give for results all the other particulars with an accuracy extending not to seconds merely, but to thirds, must be regarded as illusory.

Mr. Walker also made a verbal communication on the subject of Dr. Sherwood's alleged discoveries. He remarked that even admitting the correctness of the Doctor's hypothesis, as stated in his Memorial to Congress, still his method would be of no use for nautical or geographical purposes, for the following reasons:—

1. The apparatus for determining the dip and variation of the compass is more costly than a common sextant and mercurial horizon.

2. The observations of the dip and variation of the compass are more difficult to be made with accuracy than a common lunar observation.

3. The reduction of these magnetic observations, on the Doctor's hypothesis, would be more laborious than the working of a lunar observation.

4. Mr. Walker proceeded to show, in conformity with the remarks of Dr. Patterson, that Dr. Sherwood's assertion that he can determine the latitude and longitude from the dip alone, or from the variation alone, was contrary to the first principles of the geometry of position; since a point, in order to be determined in space, must be referred to three given surfaces. If one of them is the surface of a spheriod as in geography, then the point must be referred to two other given surfaces; whereas by the dip alone, or the variation of the compass alone, a point can only be referred to one of these two surfaces, and the resulting locus is a line and not a point. Hence, if latitude and longitude are determined by magnetic observations, it must be by both the dip and variation. Dr. Sherwood's method, therefore, could be of no use for *nautical purposes*, from the impossibility of observing the variation of the compass at sea with any tolerable degree of accuracy.

5. Dr. Sherwood's assertion that the magnetic method could be used in cloudy weather is inaccurate; since the variation of the compass cannot be ascertained without astronomical observations.

6. Restricting then the use of magnetic observations to those made on land in fair weather, still, owing to local perturbations, the probable discrepancy of the mean of many observations at one place from the theoretic dip and variation, may, at a low estimate, be assumed to be ten minutes of space, and, as the resulting errors of *latitude* are of the same order, we shall have ten miles for its probable error, which is *twenty times* that of a common sextant and mercurial horizon.

7. Owing to the proximity of the north pole to Dr. Sherwood's assumed magnetic pole, the probable error in the resulting *longitude* would far exceed that of the dip and variation themselves, and would amount to *forty* miles on the average, and between the tropics, near the line of greatest variation, to *several degrees;* whereas it is well known that by the lunar method, the probable error in longitude is less than *six* miles, and may be reduced to *four* by means of half a dozen observed eclipses of Jupiter's first satellite.

Mr. Walker concluded by remarking that although, in stating the practical objections to the method, he had taken Dr. Sherwood's postulates for granted, yet he considered every one of them as contrary to facts, observation and experience.

Progress of Civil Engineering.

Early Progress of Railways.

The following historical sketch of the progress of the railway principle, is extracted from the last number of *Fraser's Magazine*:—

"Among the proofs constantly brought forward by those who assert that the ancients were merely children in science, we have frequently seen allusion made to railroads. And yet this vaunted discovery of the younger children of Time seems to have been known to their elder brothers. At least we find Æschylus speaking, in the *Eumenides*, of a road from Athens to Delphi; which, to use his own words, Κωκυτοποι παιδες Ηφαιστου, 'the road-making sons of Vulcan,' (the god of blacksmiths) constructed, χθονα Ατιμαστον πριν, θυτις ημφαμην, 'converting a country previously wild into a civilised one,' and thus producing the very results to which Lord Brougham and his school are constantly pointing, as the beneficial consequences of the rail-road system. To what extent this principle was carried in other parts of Greece, we know not; but in a mountainous country, where there was no lack of ironstone, nor of the means of converting the ore into bars of iron, it is probable that other roads were constructed of a similar kind. Yet so little notice has been taken of them, that, but for the accidental preservation of the *Eumenides*, we should have been unable to understand the language of Herodotus. That historian, speaking of the sacred road from the sea-coast to Heliopolis in Egypt, says that it was 1515 stadia long, and exceeded by 15 stadia the one which led from the temple of the twelve gods in the forum at Athens to the temple of Jupiter, on Mount Olympus. But, whatever may have been the knowledge of the ancients respecting the principle of an iron railroad, it does not appear that they applied it to the increase of the wealth of a nation—the only thing valuable in the eyes of a Baconian worshipper of Mammon. They were content, it seems, to devote their energies to making an easier road to the temples of their faith; we, to the marts of commerce: and unless London, Birmingham, Manchester, and Liverpool, be brought within a ride of twenty-four hours, the political economists tell us that the work of the Creator has been only the job of a bungler, and that till we can fly along a railroad with the velocity of a pigeon through the air, we must be, and deserve to be, hooted at by other nations, as the silliest of bipeds without feathers.

"With regard to the principle by which heavy bodies are rolled along a smooth and level road, it appears to have been put in practice at the siege of Constantinople, when Mahomet conveyed eighty light galleys and brigantines from the Bosphorus into the shallow water of the harbour, by constructing a level way, which was covered by a broad platform of strong and solid planks, rendered slippery by the application of tal-

low; and on which were drawn the vessels moving on rollers, just as masses of stone are now-a-days into the mason's yard.

"At the commencement of the seventeenth century, coals were conveyed from the mouth of the pit to the place of consumption in carts, and even in panniers on horseback, or, as we have seen them, some twenty-five years ago, in the neighbourhood of Ashby de la Zouch, on the back of the more humble, though not less Homeric, ass. But, as roads were not then, as they now are—thanks to the genius of a Macadam!—as hard as a diamond and as level as a die, they were soon cut up by the coal carts, and in wet weather were nearly impassable. To remedy this inconvenience, *tram* roads were first constructed near Newcastle-upon-Tyne, about 1676. They were probably suggested by the unsuccessful experiments made by a Mr. Beaumont in 1646; who, after trying some plans for the better working of coal mines, and in conveying the coals in carriages of a novel construction, was ruined, like Middleton, the originator of the New River; and as Watt would have been, in all probability, had he not met with a powerful backer in his partner, Bolton. These tramroads consisted originally of wooden rails laid along the ground, made previously as level as possible. Upon these a machine, resembling a large box upon wooden rollers, and made to fit the rails, superseded the cart. The advantage gained by this simple contrivance was nearly thirty per cent. The regular load of a horse had been 17 cwt. previously; but he was enabled to draw upon the tramroad nearly 24 cwt. As the knowledge of mechanics became more generally diffused, and the doctrine of political economy, that time is money, more universally felt, various improvements were introduced in the construction of the wagons and rails. Amongst these is to be noticed the substitution of iron wheels for the wooden rollers of the wagon, and the adoption of cast iron rails, which were formed with a *flanch*, or upright ledge, to prevent the wheels from running off the track. The precise date of this change is not known. Several persons have laid claim to the invention; but from the books of the Colebrook-dale Iron Works, in Shropshire, it appears that some iron rails of that form were cast there for one of the partners, as an experiment, in 1767. It was found, however, that the flat rail, from its low position, accumulated extraneous matter, which formed a serious obstruction to the wheels. Hence the principle of the edge rail was adopted, which was fixed a few inches above the ground; and the flanch, to secure the wheel on the track, was transferred to the wheels of the wagon.

"Owing to the construction of the carriages, the horse (the only power then known) was unable to check the velocity resulting from the gravity of a descending body. Hence it was usual to detach the horse, and make him follow the wagon—a plan that led at once to the formation of a road upon a gradually descending plane, where the horse was required only upon the level portions of the line, and for drawing up the empty wagons to the summit of the ascent. But it was soon discovered that a check was requisite to impede the velocity of the descent. Accordingly, a break was introduced, acting by pressure upon the fore and hind wheels simultaneously; and which, being attached to a lever, was regulated by the attendant according to the speed at which he wished the wagon to descend. The action of the break was, however, irregular; for the rails were affected by the changes of the atmosphere, and especially in wet weather, when the wheels slid rather than revolved, from the want of a retarding rough surface.

"The next step was to dismiss the horse entirely, and to construct the road with two inclines, so that a descending train of loaded wagons might draw up an empty train, by means of a rope passing over a pulley at the top of the inclines, having its separate ends attached to the two trains. But, as the power of the loaded train was frequently too great for the weight it was required to draw up, a jerk was produced so as to snap the rope, or to cause the ascending train to bound off the rails; while, on other occasions, the power of the descending loaded train was insufficient to raise the requisite number of empty wagons. To meet the first difficulty, the friction was increased by the construction of multiplied wheels and pulleys; and to obviate the latter, a horse was employed to assist the power of the descending train.

"Here, then, from the operation of conflicting disadvantages, the rail road would have been at a stand-still, but for the discovery of the steam engine—that monster of human creation, which has more than realised the story of the hundred armed Briareus; and of which it has been said, there is nothing too great for it, nothing too small. Like the proboscis of the elephant, it can tear up an oak, or pick up a pin; can forge the heaviest anchor, and punch the eye of the finest needle; can twist the largest cable, or draw out a thread as delicate as the gossamer; can bore a cannon of the largest calibre, or form the shank of the smallest button; can drag a first-rate man-of war against wind and wave, or flatten a mass of copper till it is as thin as gold-leaf.

"About 1760, and coeval with the introduction of iron rails (first adopted, it seems, by Mr. Carr, at the Sheffield Colliery), James Watt entertained the idea of employing steam as a moving power. But the design was speedily abandoned; nor was it until 1802 that the attention of engineers was again directed to locomotive engines* upon rail roads; when a patent was taken out, and the principle tested successfully at Merthyr Tydvil, in South Wales. But here again an obstacle presented itself, which has been only partially overcome, in the tendency which iron wheels have, when passing over a smooth surface, to turn round without progressing, and especially upon an ascent. To meet this difficulty, Mr. Blenkinsop invented a rack, continued along the whole distance of the rail, in which toothed wheels worked, and thus produced a progressive motion. Messrs. Chapman, however, adopted a chain, which was stretched along the centre of the railway; and being grasped by a grooved wheel and roller, at each stroke of the engine it was impelled forwards. Mr. Brunton invented two movable iron legs, each jointed, and terminating in a claw. These were placed behind the engine; and being acted upon by the piston, fixed themselves alternately in the ground, and drove the engine forward at each stroke. But as all such expedients only increased the friction, and diminished the power of the engine, they were eventually laid aside; especially after M. Blacket had proved, in 1815, that the wheels would progress on a railway, either level or with a slight rise, if the weight to be drawn was in a certain ratio to the moving power." Mining Journal.

* Towards the end of the last century, one Oliver Evans, of Pennsylvania, is said to have invented a steam engine, with which he first ground his flour, and, after placing it on a carriage, drove it to market; but, as he had a river to cross, he substituted paddle wheels for those of the carriage, which was made like a boat, and, after crossing, he unshipped the paddles and resumed the wheels. This account, which is to be found in the "Foreign Quarterly Review," is, we suspect, a history rather of what Evans said he would do, than of what he actually accomplished.

Asphaltic Mine in Pyrimont.

The following is an account of a very curious phenomenon, which has given rise to a production of the highest importance to the arts; I mean, the mine of asphalte of Pyrimont, situated at the foot of the eastern side of Mount Jura, on the right bank of the river Rhone, and one league north of Seyssel. In that locality, the surface of the ground is covered by molasse (siliceous gravel and bitumen), which extends from the banks of the river to the foot of the mountains, covering the last strata of the superior calcareous oolite, of which these mountains are composed. The molasse is intercepted by deep ravines, in which may sometimes be seen the "calcaire inférieur," which is frequently cretaceous, and belongs to the preceding oolitic formation.

At Pyrimont, a mass of calcareous asphalte, situated between two ravines, rises from the middle of the molasse on a surface of 800 metres long by 300 metres broad. This calcareous matter, the exterior surface of which is whitish, is internally of a deep brown colour, due to a certain quantity of asphalte with which it is saturated. The asphalte is, for the most part, equally diffused throughout the rock, yet some parts may be seen more or less saturated, and others in which the calcareous matter is quite pure; the disposition of the latter, would lead to the conclusion that the asphalte is ramified in veins in the calcareous mass buried under the molasse. The calcareous asphalte is not stratified; fissures are seen, which intersect each other in all directions, and divide it into irregular blocks.

In the surrounding molasse, the bitumen has penetrated in large veins; and in the excavation of this material, galleries have been formed, which follow their various sinuosities. The molasse is also impregnated with bitumen, absolutely in the same way as the calcareous substance, and as it is more porous, the quantity of bitumen is greater.

The rock which covers the calcareous asphalte, prevents the tracing of it to its junction with that which constitutes or composes the mountain, at the foot of which it is situated, and conceals the extent to which the calcareous mass is impregnated with bitumen. But in the same mountain, above Dorche and near Sauthonod, in the Val-Romey, is to be found calcareous schistose, also impregnated with bitumen, inserted between the layers of the corallien group. According to M. Millet, the bituminous schist contains impressions of vegetable remains, which are found also in the calcareous schistose that are not bituminous, of the same group. This fact proves that the bituminous matter, whatever may be its origin, has spread itself from the interior of the Val-Romey, to the banks of the river Rhone, passing through the rocks which it met in its passage at different epochs, and in different ways.

Our colleague, M. Millet, of Aubanton, who made the analysis of those bituminous rocks, of which we have just been speaking, has arrived at the following results:

1st.—The calcareous asphalte of Pyrimont, contains from 9 to 10 per cent. of bitumen, the remainder is carbonate of lime, nearly pure.

2d.—The bituminous molasse contains as much as 15 or 18 per cent. of bitumen, the remainder is micaceous sand, exactly resembling that which composes the molasse.

3d. The bitumen extracted from the two rocks, is identically the same. Tried with sulphuric ether, it gives a yellowish substance, which

burns with flame and smoke; it is soluble in essential oils, and insoluble in acids. By distillation, the oil of petroleum is obtained in very small quantities; acetic acid is formed in the operation; the residue is brittle, and fusible at a high temperature. The part which the ether does not act upon appears to be carbon; this, when heated in the air, burns with little or no remainder.

From these results, M. Millet concludes that bitumen is a compound—

1st. Of resinous petroliferous matter, ... 60 to 70
2d. Of carbon . . . . . 30 to 35

Which would give the proportion of one to two between the resinous matter and carbon, a proportion which our colleague has found to be the same in all the analyses he has made. A great number of observations induces him to believe, that it is from the carbon that the black colour of the bitumen and its property of hardening in the air arises, which renders it so useful in the arts.

The bituminous matter being found both in the calcareous rock, and the molasse with which it is covered, it is evident that the action of the cause which has introduced it into these two rocks, succeeded the deposit of the latter; the way it is distributed in large masses, casting ramifications in various directions, and the superior parts generally containing less bitumen than the rest of the mass, shows that the bitumen has been sublimated or refined from the depth of the globe, through a fissure corresponding with the direction in which it is now observed; and that it condensed itself in the superior rocks, the heat having dilated or expanded the pores, which, by contracting themselves in cooling, might have rendered the combination as close as now seen. The nature of bituminous rocks (molasse, calcaire-crétacé, et schiste-calcaire) adapt themselves to this kind of action. The molasse and the calcareous rock are so porous, that they readily imbibe water; the calcareous schist also adheres to the tongue. It is therefore probable, that these rocks have easily been penetrated by the bituminous vapours, which most likely spread themselves over all the three at the same time.

The epoch of the introduction of the bitumen into the preceding rocks being necessarily of a subsequent date to the deposit of the molasse, one may presume that it corresponds to that of the basaltic eruptions, which, it is clearly proved, by several facts, have often been accompanied with bituminous substances: it is at the same epoch that the Alps and Mount Jura must have experienced the last commotion which has changed their form, by breaking the rocks, whose fragments, at this day, compose those enormous masses, which are covered over only by the deposits of the present era. It may be objected, that no basaltic rock is to be seen in the whole range of the mountains of Jura. To that I reply, that some are to be found in its neighbourhood, in Burgogne and in the Vosges; besides, it must be observed, that in order to cause changes on the surface of the ground, either by fractures, or by the disengagement of vapours, it is not necessary that the plutonic rocks should appear outwardly. It may happen, that in the bottom of the valleys of Jura, the basaltes are at a small depth.

The phenomenon of rocks impregnated with asphalte, is not confined in Mount Jura to those localities we have just quoted; many are also to be found in several other places on the eastern side, and particularly in the Val-Travers, near Neufchatel, but they are not so well developed as

in the neighborhood of Seyssel, nor have they acquired the same importance in the arts.

I have seen in the possession of M. Brongniart, specimens of the calcareous asphalte of Val-Travers; it resembles very much that of Pyrimont, and a fragment, of which a very small portion is impregnated, has shown me again, that it was the porous calcaire of the corallien group.

The calcareous asphalte of Pyrimont is seen on the surface of the ground, in a space circumscribed by the molasse, of 800 metres in length and 300 metres in breadth. The thickness of the mass has not yet been ascertained, but it appears to be considerable. The mass is openly worked, large blocks are extracted, which are afterwards broken to pieces.

The bituminous molasse is worked by galaries following the sinuosities of the veins: when carried to the (usine) depôt, it is broken into pieces of the size of an egg, which is refined with boiling water, to extract the bitumen from it.

The calcareous asphalte is reduced to powder, that it may be more easily mixed with the bitumen.

In the preparation of the mastic, ninety-three parts of calcareous asphalte is mixed with seven parts of bitumen, extracted from the molasse; the whole is exposed in furnaces or cauldrons, for a long time, to the action of fire; when quite fluid, it is poured into moulds of any shape that may be required, to render it portable. Many attempts have been made to imitate the mastic of Seyssel; and as a substitute for the calcareous asphalte, they have employed other substances, which absorbing from 40 to 50 per cent. of bitumen, gives a composition which the heat of the sun melts, and which, when exposed to cold, cracks. And in some cases, they have employed substances, which having no affinity whatever for bitumen separated by time.

The genuine mastic, which is melted on the spot where it is used, in a few instants after it is poured into the mould, becomes so very hard, that at a temperature of more than 30° Reaumur, = 100 Fahrenheit, it will receive no impression, yet it retains a certain degree of elasticity, whereby it adapts itself (or stretches) without breaking, to all the motions which the masonry, or roof, &c., where it is applied, undergoes.

The mastic of asphalte is employed for covering terraces, roofs of buildings, footpaths of bridges and streets, arches, cellars, and interior areas, &c.; also in the construction of aqueducts, basins, and all kinds of hydraulic works. It has been used to cement stones, bricks, and even metals.

Many works have been executed in Paris and its environs, with the mastic of Seyssel; for instance, the footpath on the Pont Royal, and that of the Louvre; trials which have so well succeeded, that the authorities of the city have decided to adopt the same materials for the footpaths of the streets, also of the Place de la Concorde (formerly called Place Louis XV.) which is about to be laid out on an extensive and grand scale.

The magazine of provision at Bercy, has been covered for upwards of a year with this mastic, and succeeds perfectly.

In the years 1832, 33, 34, this mastic was, with equal success, employed in the construction of the military works at Vincennes.

It has also been successfully employed in the military constructions at Douai, Besancon, Bourbonne-les-Bains, Grenoble, and Lyons. In the

last city, all the covering of roofs and the interior areas of the new forts have been constructed with it.

More than forty years ago, at Fort l'Ecluse, a small building was covered with this mastic, which has ever since continued in a perfect state of repair.

The asphaltic mastic, the nature of which now begins to be generally understood, will render peculiar advantages in architectural constructions.

The working of the asphaltic rocks of Pyrimont, is traced back as far as 1790, but whether the product has been little known, or whether from ignorance of its application, the mine remained in a state of stagnation till the year 1818, from which time to 1820, the annual sale rose to 200,000 kilograms. The improper application of the mastic, together with the want of sufficient capital on the part of the company who were working the mine, retarded their operations; but for the last six years, the owner, the Count de Sassanay, who resides on the spot part of the year, having devoted his attention to the subject, the working of the mines has increased to a great extent. In the year 1835, the sale of the mastic exceeded a million of kilograms, and bids fair for a continued increase.

Count de Sassanay has constructed at Pyrimont a very elegant place for the preparation of the asphaltic mastic, and devotes the whole of his attention to the perfection of the process employed in its manufacture. The importance which the use of this material of Seyssel will give to the constructions at Paris, must justify in the eyes of the society, the details into which I have entered, with regard to that substance.

Mining Rev.

On Iron best suited for Railways; BY DAVID MUSHET.

The following conclusions at which I have arrived on the important subject of the nature and habitudes of malleable iron, particularly that adapted to railway purposes, are the result of many experiments, and of forty years unremitted application to iron making.

1st. I consider that a crystalline arrangement of the fracture of bar iron is incompatible with great strength and fibre, and that it is essential to railway iron that it should be hard and fibrous.

2nd. The more frequently iron is heated or melted in the course of its progress towards its completion as bar iron, the greater is its tendency to crystallize and become brittle when cold. This is in some measure prevented by repeated rollings; but fibre acquired in this way is to a certain extent artificial, for where native fibre is absent, heating and cooling will restore the crystalline arrangement and weaken the tenacity of the iron when cold.

3rd. Excessive decarbonization, commonly called refining, which tends to deprive the iron of its last portion of carbon, produces a quality of malleable iron, soft, and easily abraded by rubbing or friction, and therefore, in point of durability, not well calculated for rail iron.

4th. Conversely, iron manufactured so as to retain the last, and consequently, the most intimately united portions of carbon, or to have this substance communicated to it in minute portions in working, is upon two accounts better calculated for rail-making (provided the fibre

is not injured) because it will wear less by rubbing, and be subject to less waste by oxydation.

5th. Bar or malleable iron has a tendency to crystallize in the cooling, in proportion to the size of the manufactured mass, a circumstance deserving the greatest consideration on the part of the engineer in determining the form or shape of his rails.

6th. Continued vibration, such as is produced by the motion of an engine or wagon traveling on a railway, causes iron to crystallize, and to a certain degree become brittle. Hence the importance of making rails from iron full of fibre, so as to postpone the time of crystallization to as remote a period as possible.

7th. Unless impaired or destroyed, by the repeated heatings and fusions to which iron is subjected in the progress of its manufacture, the quantity and strength of fibre developed, will mainly depend upon the proportion of carbonaceous matter, originally contained in the pig-iron from which it is manufactured.

8th. It is essential in rail making, to have a quality of iron, which, without dropping or opening at the rolls, will stand a degree of heat capable of compactly and adhesively welding the piles together so as to prevent exfoliation or separation of the parts when subjected to rail-road traffic.

Considering the foregoing conclusions to be well founded, it has often been to me a matter of surprise, that the two most important qualities of iron for rails, namely, fibre and hardness, have seldom or never formed a condition in any railway contracts for rails. Certain manipulations or stages of operations, which may be necessary in making iron for smiths, or indeed for general purposes, are usually stipulated for without its being taken into the account, that the properties required in railway iron may be quite the reverse. The consequence of this oversight, has been to withdraw the attention of the manufacturer from these important desiderata, and induce him to follow the letter of the engineer's specification as to process, leaving the properties of fibre and hardness to the chapter of accidents.

The present process of bar iron making, is in some measure incompatible with the production of the above mentioned requisites for railway iron, and this may serve to account for the difficulty of obtaining fibrous masses, such as rails of 60 to 75 lbs. per yard, as well as for the want of hardness in the body of the rail itself. The whole process is one of severe decarbonization. The pig iron for the refinery is in most situations chosen with as small a portion of carbon as will enable it to melt. In this furnace, in order to separate about 4 per cent. of carbon, manganese, silica, &c., from 12 to 15 per cent. of the whole quantity of iron is lost, by being converted into a slag or scoria of a most deleterious quality. After the pig iron has, by melting, passed under the blast, and penetrated the body of cinder, it is then literally set on fire by the action of the blast pipes on its surface, and the decarbonization is carried on, not by fermentation as in puddling, but by a true combustion of a part of the iron, and by a change of surface produced by an alteration in the specific gravity of the particles of the iron. Should the quantity of refinement have been limited, the new arrangement resulting from the fusion of the iron, in so high a temperature, will be found unfavourable to fibre in the ultimate result. So, that to produce any certainty in this respect, it becomes necessary to prolong the refinement

until a new and steelly arrangement takes place, and this arrangement of the iron in running from the furnace, is indicated by the extreme levity, intense combustion, greater waste, and a porous, or honey-comb, fracture of the metal when cold.

This commixture of crude iron and steel, is again melted by flame in the puddling furnace, where it undergoes, by the addition of cinder, a process of fermentation, which carries off the last portion of carbonaceous matter, and leaves the iron comparatively soft when cold.

The reverse of this takes place in the manufacture of charcoal iron. In this operation, the pig iron, during the single process which converts it into malleable iron, is always in contact with fuel. This prevents that total decarbonization which takes place with puddled iron that has passed through the refinery. Hence the superior hardness and tendency towards steel in Swedish and Russian iron.

To the subject of fibre, my attention has for some years been directed. At various times I have made numerous experiments, and it has been gratifying to find, that the same means employed to obtain fibre, to a certainty produced a superior degree of hardness and durability, and altogether avoided the process and waste of the refinery. In the method I have adopted (and for which I have lately taken out a patent) the charge of pig iron is at once introduced into the puddling furnace, where it is subjected to an imperfect, though uniform, fusion, the temperature being no more than is barely necessary to melt it. In this state a portion of finely ground rich iron ore, as a substitute for cinder, is from time to time thrown upon the iron and worked into it by the puddler. In a short time considerable fermentation takes place, and gas is evolved. In twelve or fifteen minutes pig iron of the most crude and fusible description, is converted into malleable iron, which appears in a flakey and divided state. The heat being increased, the iron coaleses and is formed by the puddler into what are called balls of puddled iron. These are, in the usual way, taken to the hammer or rolls, and elongated into bars called No. 1, or puddled bars. These again are cut into certain lengths, piled upon each other and re-heated, and for the purpose of railway iron rolled into broad bars or slabs, known by the name of No. 2 iron. These in their turn, are either piled alone a second time, or mixed with narrower iron, re-heated and rolled into rails in that state, which is called No. 3 or best iron.

The quantity of iron ore required to decarbonate the pig iron, depends upon the fusibility of the latter, and varies from one-tenth to one-twentieth the weight of pig iron; and the fusibility principally depends on the quantity of carbonaceous matter contained in the iron, which is as various as the numerous shades between white iron and dark grey foundry iron.

By following this process a considerable saving of pig iron is effected at a very trifling increase of expense for ore, and additional labour beyond the expense of the usual mode of working. This is one great advantage of the process, but the most important consists in being able at all times to develop, in the first stage of the manufacture, a certain quantity of strong fibre, which is increased during the ulterior operations, and conjoined with great hardness.

Iron ore when used in the puddling furnace, whether with pig iron or with refined metal, decarbonates the iron by means of oxygen which it presents to the carbon united with the iron, and at the same time it calls

into existence an unusual display of fibre. This remark applies as well to refined metal as to pig iron, and no degree of fusibility on the part of the pig iron retards the full and beneficial effect of the iron ore, provided it be applied in proper quantity.

I consider pig iron, and not refined metal, as the true source of strength, hardness, and fibre in bar iron, particularly when cold, and as these qualities can at all times be obtained by a judicious selection of pig iron, and the use of iron ore, we may consider ourselves in possession of a method by which these three great requisites to the production of railway iron are secured. I have only further to remark, that it is probable the piling and rolling in the first instance may be done away with in the making of railway iron, by hammering the puddled balls into large and solid blooms, to be afterwards rolled into rails. By following this line of operation, the great evil of lamination, as it is called, or a separation of the piles, hitherto so injurious to durability, would be got rid of.

Lond. Mech. Mag.

On Captain Huddart's Improvements in Rope Machinery. By W. Cotton.

The attention of the late Captain Huddart was directed to the subject of rope-making, from observing every morning during a voyage, that some of the external yarns of a ship's cable were broken.

This was evidently to be attributed to the additional strain which the outer yarns experienced in the process of twisting, the yarns being all originally of the same length. It was proposed to obviate this defect by giving to all the yarns an increased length in proportion to the distance of the yarn from the centre of the strand, and to the angle at which it was laid. The success which attended these efforts induced Captain Huddart to construct the large laying machine, which was found to answer completely, and to give each strand its proper length and proper degree of twist, and to preserve throughout the longest rope the same press and the same angle.

The paper contains some historical notices respecting the establishment of the extensive works of Huddart and Co., at Limehouse, and the various stages of improvement. Several pieces of strand, to illustrate the foregoing principles, were presented, as also a piece of the twenty-two-inch cable made for the East India Company's ship Waterloo; a strand of the long rope made for the London and Birmingham Railway; and some cards containing the comparative strength of the warm and cold, registered and common, cordage.

The distinguished individual of whose improvements in rope machinery a brief account has been here given, was born at Allenby, in Cumberland, in 1741, and died in 1816, after a life devoted to the pursuit of those scientific researches for which his rare talents so eminently qualified him.

In the strands, as constructed on this principle, the strain on all the yarns will be the same so long as the original degree of twist is preserved; but if the strand becomes untwisted, there is an extra strain on the internal yarns; if more tightly twisted, on the external yarns; several strands, however, being worked together in a cable, the twisting or untwisting of each particular one is prevented.

Trans. Civil Engineers.

Note on foundations upon sand; and on coatings of mineral tar: by M. Olivier, *engineer of Roads and Bridges.*

Translated for the Journal of Franklin Institute, by J. Griscom.

1. *Foundations on Sand.* At the school *des Ponts et Chaussées*, in 1830, it had been pointed out to us, that foundations on sand might be laid, wherever the earth was compressible, and in no danger of being carried away by floods. The canal of Saint Martin was given as an example. I have several times applied the system thus indicated and always with success. The following are examples: M. Dupuis, one of the conductors in my district, an architect of the town of Pont-Auderner, was employed to erect a building for the mayoralty. Its situation required that the edifice should be founded on the natural soil. This was well, for there is, in the valley of the Rille, a little below the soil, a bed of solid stones, mixed with sand, of about 31½ inches thick. M. Dupuis, feared that the ground under the bed of gravel was not good, and he had it sounded. It proved to be compressible, and when the gravel was removed, it became impossible to lay a good foundation on the earth which it covered. The architect deemed it needful, in consequence, to resort to piles, and these, it was ascertained, must be very long to reach solid ground. I went to see the work as they were beginning to drive the piles: it was a very expensive undertaking, which I proposed they should avoid, by substituting a bed of water sand, well watered with cream of lime. M. Dupuis, being responsible for the work, could not decide upon taking this advice, and continued the piles sufficiently for the whole front wall; but he adopted for the other walls the plan I had recommended. These were all, of course, united, though resting on different foundations, but they have all remained firm without any movement, or at least it has been uniform.

This furnishes a new proof of the safety of foundations on sand; 1st, since all the erections in the valley of the Rille, founded on the bed of gravel before mentioned, stand very well, though the ground underneath is compressible; 2nd, since the walls placed on sand, resting on soft ground, have not sunk more than those built on piles, driven with the greatest care to a solid foundation.

Another fact. M. Fauquet Lemaitre, is a proprietor, at Bolbec of several cotton factories. One of them being burnt down, he extended the other, which made it necessary to connect the new with the old walls: these walls, situated at the foot of a hill, were partly on a mass of chalk and partly on a bottom of green sand, in spaces where no chalk existed. This sand was moistened by infiltrations of water, which could not however wash it away. When a weight was placed on this sand and left at rest, the mass remained firm; but if a little motion were given it, it became pasty and almost liquid. The builder thought he must have recourse to piles, and several foundations were prepared for their being driven, when M. Fauquet spoke to me about his buildings, and of the position in which he found himself. At this time, the experiment before cited had been made, and I advised him to lay his foundations on sand. I requested him to converse with M. Frissard, chief engineer at the Port of Havre, and he did so. The latter coincided with me, and added that all the masonry of the steam engine of 60 horse power, was founded on sand, and nothing had moved it. It was not so with the struc-

tures on piles; a side wall, connected with the foundationof the engine, placed on piles driven as deep as possible, had moved so much that the connecting stones were broken, so that they had to saw them off from the engine walls, the level of which had not changed. This accident, it was believed, occurred from the water contained in the sand, having collected more abundantly around the piles; and the friction of the latter against the ground, being thus diminished, they sunk until the masonry rested on the sand.

As other walls erected on sand or on rocks, have not moved, this experiment proves that foundations on sand are as safe as those on rocks, while we cannot rely upon the stability of an edifice constructed on piles and driven into sand; the friction which they encounter induces the belief that they have gone as far as possible, or necessary, and when any cause diminishing this resistance from friction occurs, an accident follows which proves the contrary.

The first experiment was made under my own eyes; the second I did not witness, but have every reason to believe that a true account was given me.

2. *Employment of mineral tar in structures of masonry.* It has for a long time appeared to me that mineral tar, which does so well upon wood and iron, might also be used for covering stone and brick work, as a defence against moisture. Four experiments were made which confirmed this apprehension. But it will be well to premise that as mineral tar is obtained by distilling vegetable materials, it would be more suitable to call it pyroligneous tar.

Without touching upon all the cases in which pyroligneous tar may be employed, which we believe to be very numerous, we shall simply cite a few in which we have tried it.

The light house of Quillebuef had become much degraded by North East storms. The rains were very copious, and the water passing into the brick tower, caused the bottom of the stair case to rot. We repaired the masonry, and in the month of May 1833, painted the tower with pyroligneous tar, which so far has perfectly answered our expectations; excepting that a few of the pilots pretend that the light house, being now black, is not seen so well as when it was white.

M. de Cachelu painted with the tar an earthen wall, exposed to the rains so much as to become very wet inside the building. When I saw these walls, the tar had served as a complete defence against the dampness.

Walls much exposed to storms of rain, are commonly defended by a coating of slate or cement, but the above experiments shew that these two modes of defence may be advantageously replaced by a coating of pyroligneous tar.

The joints of the wall being well filled up and smooth, the tar is spread over it and it penetrates the wall. When dry, a second coat is applied and immediately powdered over with sand. This, when solidified, is covered with lime white wash, as thick as can be put on with a brush. This, acting on the carbonic acid of the atmosphere, forms a crust of limestone which exists for a long time, and once in two or three years the wall may be re-white-washed.

We have employed this treatment on bridges very successfully.

In courts, and yards, and terraces, the tar coating is now employed with great advantage. When worn or broken it is easily repaired.

Annales des Ponts et Chaussées.

Mechanics' Register.

Progress of Railways in England.

In the course of three years, 1500 miles of railway will, in all probability, be executed in England alone, and, calculating the average cost, inclusive of engines, at 20,000*l* a mile, 30,000,000*l*. will have been spent in carrying them into execution. It is an unprecedented advance in the improvement of intercourse, and it is a plain speaking fact of the estimation in which this mode of travelling is held by the nation, both as an investment and as an improvement on the old system. England is not, however, the only country in which railways have made such rapid strides.

Lond. Mech. Mag.

Patent Furnace for Consuming Smoke.

On Friday, the 20th, inst., in Messrs. Vernon and Company's boiler works, was exhibited a most successful trial of a full-sized locomotive fire-box, constructed upon a plan for burning smoke, for which Mr. John Gray, of the Liverpool and Manchester Railway Works, has taken out a patent. We congratulate Mr. Gray upon having made such an important discovery, which must necessarily be a source of great profit to himself, as well as incalculable benefit to the public. We acknowledge that we had been rather sceptical on the subject of burning smoke, inasmuch as all the plans which we had previously seen in operation for this purpose, have been more or less liable to objections which have militated against their general practicability, but in this case there is nothing arising out of its construction in either expense, danger, or complexity, which can operate against its universal adoption, but on the contrary, the smoke was most completely consumed upon a simple, cheap, and safe plan. It is applicable either to locomotive, marine, or land boilers, and we have no hesitation in predicting that it will soon be in general use. Upon a fair calculation, it appears that the Liverpool and Manchester Railway Company, alone, may save by it upwards of 6000*l*. a year, by substituting coals for coke, which they are at present compelled to use in order to dispense with smoke. In marine or land boilers, the saving must also be enormous, by burning those dense clouds of smoke which, in ordinary cases, are suffered to escape at the chimney tops, thus rendering available the vast accumulation of carbon which it contains. Two locomotive engines are now in progress of being made by Messrs. Thomas Vernon and Co., with fire boxes upon this plan, which are intended to burn coals instead of coke, the success of which we deem quite certain.

Min. Journal.

A method of breaking Ice by forcing it upwards instead of downwards; practised on the Herefordshire and Gloucestershire Canal in the Winters of 1834, 1835 *and* 1836; by Stephen Ballard, A. Inst. C.E.

Mr. B. places strong planks covered on their upper side with sheet

iron in the front of a boat, so as to form an inclined plane pointing downwards, the lower end of which goes under the ice. The boat, drawn by a horse, is steered by a person walking on the shore with a long shaft attached to a pole projecting over the stern. It is believed that one boat, horse, and boy, would thus break much more ice than three boats worked in the usual manner.

Journ. Arts and Sci.

Eye Shaped Windows.

The peculiarity of this place, and which kept us laughing at the recollection for nearly a mile after we left it, was the windows in the roofs of the houses. They are shaped exactly like eyes: the tiles swell up gradually like a lid above and below, elongating towards the end; and in the oval space between these twinkles the little bright window pane, just in the place of the pupil. It was, in fact, as exact a model of the human eye as could be made out of such materials. I never saw any thing so funny. The whole village had an *eveille* Argus-like look, that was irresistably droll; all the houses laughing, and blinking, and peeping at us as we drove in. The shape being long, and the lower lid rather straight, gave them a sly, sleepy, half closed expression, and, withal, a look of fun and merriment, as if the house were "holding its sides" with laughter. Sometimes we came to a great Cyclops building, with its one staring optic in the middle of the roof; and then appeared a comical intelligent looking thing, with a pair, that twinkled and screwed themselves up at us as we passed, in the most provoking and impertinent manner possible. It was really too bad. (*A Lady's Souvenirs of a Tour in Germany.*

Arch. Mag.

Frozen Ground of Siberia.

The whole of the Northern Siberia presents the singular phenomenon, that, even in the hottest season, the soil remains frozen from a certain depth downwards, differing according to the latitude, and other local circumstances, and that the thickness of this frozen stratum is so considerable in the more easterly places as for instance, at Jakutzk, that its bottom has not yet been reached. Gmelin relates that in the archives at Jakutzk, he found an account of an inhabitant of that town having, at the beginning of the last century, together with some Jakuters, contracted to sink a well, and that, when they had reached the depth of ninety feet, finding the earth still frozen, they refused to fulfil their engagement. Some philosophers have considered this contradictory to the supposition that the interior of the earth is in the state of fusion. But from the following account it will be seen that, in those frozen strata, the general phenomenon of an increase of temperature with the depth is not wanting, and that by continuing the work, they have arrived at a temperature which leaves no doubt that they are not far from the lower limits of the frozen soil, and that water, the object of their undertaking, is not far distant. An article from St. Petersburg, in the Berlin News of the 24th February, 1832, states that at Jakutzk,

in Siberia, the earth, even in the hottest summer, only thaws to about the depth of three feet. Hitherto all attempts to discover the thickness of the frozen strata beneath, have been fruitless. Since the year 1830, one of the inhabitants of Jakutzk has been engaged in sinking a well, by which means it may perhaps, be ascertained. In the same year the workmen reached the depth of seventy-eight feet below the surface, but still found no water. In the year 1831, they reached ninety feet, and were still in the frozen soil. The work is still in progress, and there seems no doubt of their attaining their object, for the thermometer, which showed 18 deg. 5 min., a few feet below the surface, rises, when sunk to the bottom of the well, to 29 deg. 75 min.—*Edin. Phil. Journ.*

Min. Jour.

Condensation of Moisture on Optic Glasses.

The condensation of moisture which is apt to take place upon the object glasses of telescopes in the atmosphere of the evening, may it is said, be obviated by the employment of a tube of pasteboard 12 or 18 inches in length, so constructed as to fit upon the object end of the instrument. The invention, is ascribed to the celebrated astronomer De la Hire.

Lond Mech. Magazine.

LUNAR OCCULTATIONS FOR PHILADELPHIA, DECEMBER 1838.					Angles reckoned to the right or westward round the circle, as seen in an inverting telescope. ☞ For direct vision add 180° ☜	
Day.	H'r.	Min.	Star's name.	Mag.	from Moon's North point.	from Moon's Vertex.
2	16	14	Im. *c* Aurigue	6	102	162
2	17	18	Em.		233	293
4	9	24	N. App. ☽ & λ Cancri 6 ☽ S. 0.′3			
21	4	48	Im. 50 Aquarii	6	55	62
21	5	10	Em.		21	34
24	9	34	Im. ε Piscium	4	105	148
24	10	39	Em.		319	7
26	13	39	Im. 47 Arietis	6	152	206
26	14	18	Em.		237	290
27	7	24	N. App. ☽ & *b* Pleiadum, 4,5 ☽ S.2.′2			
27	7	17	Im. *d* Pleiadum	5	119	70
27	8	33	Em.		293	267
27	8	25	Im. (151) Pleiadum	7	167	138
27	9	13	Em.		244	244
27	7	59	Im. ε Tauri	3	124	85
27	9	17	Em		286	286
27	8	54	Im. *f* Pleiadum,	5	77	64
27	10	0	Em.		327	353
27	8	54	Im. *h* Pleiadum,	5, 6	94	81
27	10	11	Em.		309	341
30	16	32	Im. 47 Geminorum	6	86	145
30	17	31	Em.		238	295

Proposed mode of obviating the dangers which now exist in carrying on the works of that ill-fated undertaking, the Thames Tunnel.

Let a raft or deck, be constructed of massive timber, and caulked similar to a ship's deck; this raft must be 30 or 40 feet wider than the Tunnel, and sufficiently long to cover that part of the bed of the river immediately over the part of the Tunnel where operations are being carried on: by laying a sufficient weight upon the raft, it could be sunk and imbedded into the bottom of the river, so as to form, I think, a complete protection to the workmen underneath. The irruptions which have taken place proceed, I believe, from two causes; first, from the loose nature of the soil composing the bed of the river; and, secondly, from the immense pressure of the great body of water; the raft would undoubtedly counteract the evil of the pressure of water, and if sufficiently imbeded into the bottom of the river by heavy weights, would, I think, become sufficiently water-proof to enable the workmen to excavate to the bottom of the raft, if necessary, without the fear of inundation. When that part of the Tunnel was completed over which the raft was placed, it could be removed by the following simple means.

Let an iron ring be strongly inserted at each corner of the raft, at low water. Chains could be easily attached to these rings; then tightly moor a lighter to each chain; and as the tide rises, the raft would also rise, and could be easily lowered over that part of the Tunnel next in operation.

Lond. Mech. Mag.

Meteorological Observations for June, 1838.

Moon.	Days	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inch's	Inch's			Inches.	
☾	1	56	82	29.85	29.75	SW.	Brisk.	.27	Clear—rain.
	2	62	76	80	85	W.	do		Partially cloudy—clear.
	3	52	78	80	80	W.S.	Moderate.		Clear—do.
	4	58	74	80	75	S.	do.	1.00	Fog—rain.
	5	62	73	40	40	NE.	do.	.95	Cloudy—rain
	6	60	67	44	44	N.E.	do		Partially cloudy—do. do.
	7	56	73	40	50	W.	Brisk.		Cloudy—clear.
	8	60	84	80	80	W.	do.		Clear—do.
☉	9	64	86	30.00	30.00	E.W.	Moderate.		Clear—do.
	10	56	88	00	00	W.	do.		Clear—do.
	11	68	88	29.95	29.95	W.	do		Clear—do.
	12	68	88	90	90	W.	Brisk.		Clear—do.
	13	70	90	86	86	W.	Moderate.		Clear—do.
	14	70	88	90	90	W.	do.		Clear—do.
	15	70	87	95	95	S.W.	Brisk		Clear—do.
☽	16	68	84	95	95	S.W	do.		Clear—flying clouds.
	17	76	85	85	60	SW.	Moderate.		Cloudy—clear.
	18	64	85	60	60	N.E.	do.		Cloudy—do.
	19	58	70	30.00	30.00	N.E.	do.		Clear—do.
	20	50	77	5	5	E.	do.		Clear—do.
	21	61	80	29.95	29.95	S.W.	do.		Cloudy—clear.
	22	68	86	86	83	S.W.	do.		Clear—flying clouds.
⊗	23	68	91	80	80	S.W.	do		Clear—do.
	24	68	78	78	70	S.	Calm.	1.20	Showery—heavy thunder—shs.
	25	68	80	70	70	S.W.	Moderate.	.28	Clear—rain.
	26	61	80	75	80	W.	Brisk.		Clear—do.
	27	63	80	96	96	N.W.S.W.	Moderate.		Clear—lightly cloudy.
	28	68	76	80	75	W.	do.	.03	Cloudy—showery.
	29	68	83	78	78	W.E.	do.		Clear—do.
	30	69	80	78	80	S.E.	do.	.28	Cloudy—showery.
	Mean	62.80	81.60	29.81	29.81			4.01	

	Thermometer.	Barometer.
Maximum height during the month.	91. on 23d.	30.05 on 20th.
Minimum " " "	50. on 29th.	29.40 on 5th, and 7th
Mean	72.20	29.81